

FINAL WILDLAND FIRE MANAGEMENT PLAN

SENEY NATIONAL WILDLIFE REFUGE



2003

WILDLAND FIRE MANAGEMENT PLAN

SENEY NATIONAL WILDLIFE REFUGE

GREAT LAKES-BIG RIVERS REGION

Prepared:

Michael G. Tansy Biologist, Seney National Wildlife Refuge	Date
---	------

R. Gregory Corace, III Forester, Seney National Wildlife Refuge	Date
--	------

Gary Lindsay Prescribe Fire Specialist, Seney National Wildlife Refuge	Date
---	------

/s/ Cal Gale Cal Gale Fire Program Analyst, R.S. Staffing Services, Inc.	Date
--	------

Tracy Casselman Project Leader, Seney National Wildlife Refuge	Date
---	------

Concurred:

Tom Zellmer Zone Fire Management Coordinator	Date
---	------

Brian McManus Regional Fire Management Coordinator	Date
---	------

Tom Worthington Chief, Refuge Operations	Date
---	------

Nita Fuller Chief, Division of Refuges	Date
---	------

Approved:

William Hartwig Regional Director	Date
--------------------------------------	------

TABLE OF CONTENTS

I.	INTRODUCTION	4
A.	MISSION STATEMENTS	4
B.	STATUTORY AUTHORITIES	5
II.	COMPLIANCE WITH U.S. FISH AND WILDLIFE SERVICE POLICY	6
III.	DESCRIPTION OF REFUGE	7
A.	LOCATION	7
B.	HISTORY	7
C.	CLIMATE	8
D.	TOPOGRAPHY AND GEOLOGY	8
E.	SOILS	9
F.	WATER	10
G.	AIR	11
H.	COVER TYPES	12
I.	HISTORICAL AND ECOLOGICAL ROLE OF FIRE	15
J.	REFUGE FIRE HISTORY	16
K.	FIRE EFFECTS	18
IV.	FIRE MANAGEMENT GOALS AND OBJECTIVES	20
A.	FIRE MANAGEMENT GOALS	20
B.	FIRE MANAGEMENT OBJECTIVES	20
V.	FIRE MANAGEMENT STRATEGIES	20
A.	STRATEGIES TO MEET FIRE MANAGEMENT GOALS	20
B.	FIRE USE STRATEGIES	21
C.	LIMITS TO STRATEGIES	21
VI.	FIRE MANAGEMENT RESPONSIBILITIES	22
A.	PERSONNEL	22
B.	REFUGE STAFF RESPONSIBILITIES	22
1.	Refuge Manager (RM)	22
2.	Fire Management Officer (FMO) or Prescribed Fire Specialist (PFS)	22
3.	Zone Fire Management Officer (Zone FMO)	22
4.	Regional Fire Management Coordinator (RFMC)	22
5.	Administrative Officer (AO)	23
6.	Remainder of Refuge Staff	23
C.	FIRE COOPERATORS AND INTERAGENCY COORDINATION	23
VII.	NORMAL UNIT STRENGTH	24
A.	ENGINES, TOOLS, AND OTHER EQUIPMENT	24
B.	EQUIPMENT AND SUPPLIES (CACHE ITEMS)	24
C.	PERSONNEL AND LEVEL OF FIRE QUALIFICATION	24
VIII.	PREPAREDNESS	25
A.	CURRENT STAFF AVAILABLE TO MEET POSITION NEEDS	25
B.	PRE-SEASON READINESS ACTIVITIES	25
1.	Training	25
2.	Fitness	25

C.	EMERGENCY PREPAREDNESS (PRELIMINARY STEP-UP PLAN)	27
1.	Initial Attack	27
2.	Extended Attack	28
3.	Transition to a Type II Incident	29
IX.	FIRE MANAGEMENT UNITS AND FIRE BEHAVIOR	30
A.	BACKGROUND	30
B.	FIRE MANAGEMENT UNIT 1	31
C.	FIRE MANAGEMENT UNIT 2	32
D.	FIRE MANAGEMENT UNIT 3	34
E.	FIRE BEHAVIOR	36
X.	FIRE SUPPRESSION	38
A.	BACKGROUND	38
B.	SUPPRESSION STRATEGIES AND TECHNIQUES	38
C.	LIMITS TO SUPPRESSION ACTIVITIES	38
D.	RECORDS AND REPORTS	39
XI.	PRESCRIBED FIRE PROGRAM	40
A.	BACKGROUND	40
B.	PROGRAM POLICIES	40
C.	PROGRAM DESCRIPTION, PROBLEMS, AND SOLUTIONS	40
1.	Weather	40
2.	Fuel	41
3.	Topography	41
4.	Season	41
5.	Smoke Management	41
6.	Hydrology	41
D.	PROCEDURES FOR BURNING	42
E.	PROGRAM UNITS	45
1.	Marsh and Open Wetland Type	46
2.	Upland Grass Type	46
3.	Upland Forest Types	46
4.	Wetland Forest Types	47
5.	Riparian Types	47
F.	RECORDS	47
XII.	WILDLAND FIRE USE PLANNING AND ASSESSMENT	47
A.	WILDLAND FIRE IMPLEMENTATION PLAN PROCESS	48
1.	WFIP - Stage I: Initial Fire Assessment Purpose	50
2.	WFIP - Stage II: Short-Term Implementation Actions - Purpose	51
3.	WFIP - Stage III: Long-Term Assessment and Implementation Actions - Purpose	51
B.	WILDLAND FIRE USE ACTIONS	51
1.	Stage I: Initial Fire Assessment	51
2.	Stage II: Short-Term Implementation Actions	55
3.	Wildland Fire Implementation Plan - Stage III: Long-Term Assessment and Implementation Actions	58
4.	Periodic Fire Assessment	60
C.	MAXIMUM MANAGEABLE AREA DETERMINATION	61
D.	LONG-TERM RISK ASSESSMENT	63

XIII. ADDITIONAL OPERATIONAL ELEMENTS.....	65
A. PUBLIC SAFETY	65
B. PUBLIC INFORMATION AND EDUCATION.....	65
1. Wildfire Suppression.....	65
2. Prescribed Fire.....	65
C. FIRE CRITIQUE AND PLAN REVIEW	65
1. "Hotline" Review	66
2. Incident Management Team (IMT) Closeout and Review.....	66
3. Prescribed Fire/Wildland Fire Review	66
4. Refuge Level Review	66
5. Regional Level Review	67
6. Reviews as They Pertain to Prescribed Fires	67
7. Prescribed Fire Critique and Review.....	67
XIV. AIR QUALITY AND SMOKE MANAGEMENT GUIDELINES.....	68
XV. FIRE RESEARCH AND MONITORING NEEDS.....	69
APPENDICES	70
APPENDIX A: REFERENCES CITED	71
APPENDIX B: CONSERVATION PRIORITIES FOR REGION 3	72
APPENDIX C: POSITION NEEDS FOR FIRE MANAGEMENT PROGRAM AND EXISTING PERSONNEL	73
APPENDIX D: COOPERATOR AGREEMENTS	74
APPENDIX E: WILDFIRE MOBILIZATION PLAN.....	75
APPENDIX F: NORMAL UNIT STRENGTH	76
APPENDIX G: COOPERATOR EQUIPMENT	77
APPENDIX H: REFUGE CONTACT NUMBERS.....	78
APPENDIX I: REFUGE DISPATCH PLAN.....	79
APPENDIX J: MINIMUM IMPACT SUPPRESSION REQUIREMENTS	80
APPENDIX K: FIRE COMPLEXITY ANALYSIS	82
APPENDIX L: WILDFIRE SITUATION ANALYSIS.....	86
APPENDIX M: ENVIRONMENTAL GUIDELINES FOR FOAM/RETARDANT USE	97
APPENDIX N: FIREBREAKS AND WILDLAND-URBAN INTERFACE PROJECTS.....	98
APPENDIX O: GO-NO-GO CHECKLIST.....	101
APPENDIX P: MINIMUM TOOLS EXAMPLES.....	102

LIST OF FIGURES

FIGURE 1 - SENEY NATIONAL WILDLIFE REFUGE	7
FIGURE 2 - SENEY SAND LAKE PLAIN.....	8
FIGURE 3 - PRE-EUROPEAN VEGETATION	13
FIGURE 4 - COVER TYPES - SENEY NATIONAL WILDLIFE REFUGE.....	15
FIGURE 5 - BREAKDOWN OF 1976 WALSH DITCH FIRE AT SENEY NATIONAL WILDLIFE REFUGE BY ACRES AND TYPE OF BURN (ADAPTED FROM ANDERSON 1982).....	17
FIGURE 6 - FIRE MANAGEMENT UNITS	30
FIGURE 7 - COVER TYPES OF FIRE MANAGEMENT UNIT 1	32
FIGURE 8 - COVER TYPES OF FIRE MANAGEMENT UNIT 2	33
FIGURE 9 - COVER TYPES OF FIRE MANAGEMENT UNIT 3	35
FIGURE 10 - PRESCRIBED FIRE UNITS	46
FIGURE 11 - WILDLAND FIRE IMPLEMENTATION PROCESS	48

FIGURE 12 - RELATIVE RISK RATING	54
FIGURE 13 - STAGE III NEED ASSESSMENT CHART	58
FIGURE 14 - MAXIMUM MANAGEABLE AREAS	63
FIGURE 15 - PROPOSED FIRE BREAKS.....	98

LIST OF TABLES

TABLE 1 - POOL SIZE AT SENEY NATIONAL WILDLIFE REFUGE BY UNIT	10
TABLE 2 - APPROXIMATE ACREAGE OF MAJOR LAND COVER TYPES	14
TABLE 3 - REPORTED FIRE HISTORY FOR THE SENEY AREA FOR THE PERIOD 1915-1936.....	16
TABLE 4 - KNOWN WILDFIRE HISTORY AT SENEY NATIONAL WILDLIFE REFUGE (1944-2001) BY CAUSE AND YEAR.....	18
TABLE 5 - STEP-UP PLAN FOR PREPAREDNESS ACTIONS	27
TABLE 6 - WILDLAND FIRE USE DOCUMENTATION	48
TABLE 7 - WFIP PROCESS	49
TABLE 8 - FIRE SITUATION.....	52
TABLE 9 - DECISION CRITERIA CHECKLIST	53
TABLE 10 - 13 - FIRE BEHAVIOR RATINGS.....	57
TABLE 14 - STAGE II ANALYSIS	57
TABLE 15 - STAGE III: LONG-TERM IMPLEMENTATION ACTIONS	59
TABLE 16 - RE-VALIDATION CHECKLIST	60
TABLE 17 - PERIODIC FIRE ASSESSMENT FREQUENCY	61

I. INTRODUCTION

United States Department of Interior policy states that refuge lands with burnable vegetation must have an approved Fire Management Plan (FMP). The following FMP for Seney National Wildlife Refuge (NWR) has been developed to provide guidelines for fire management operational procedures. These procedures involve consideration of the use of fire in restoring and maintaining Refuge and regional-level biodiversity through the restoration and maintenance of Refuge forest/wetland structure and composition. To this end, this plan incorporates information from a number of existing documents including the Refuge Technical Report (1979), prior Fire Management Plans, a fire history report, and various published works.

Since other related resource management plans do not address the environmental impacts of fire management activities, this FMP is subject to National Environmental Policy Act/National Historic Preservation Act compliance. Seney NWR does not at present have either a Comprehensive Conservation Plan (CCP) or a Habitat Management Plan (HMP).

A. MISSION STATEMENTS

The mission of the U. S. Fish and Wildlife Service (Service) is:

Working with others to conserve, protect, and enhance fish, wildlife, plants and their habitats for the continuing benefits of the American people.

The mission of the National Wildlife Refuge System is:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

The mission of Seney NWR as described in the approved "Vision for the Future" statement is:

Maintain a complex mosaic of habitats that supports an array of both wetland and upland wildlife species. Plant succession will be actively managed to maintain a wide range of conditions.

Management at the Refuge is from an ecological perspective with consideration of the effects of management practices on existing patterns and processes. While management for migratory waterfowl and other migrants is of primary importance, attention is given to providing habitat for a wide range of species. In doing so, managers consider the use of fire as a tool useful in restoration and maintenance of wetland and upland habitat types.

B. STATUTORY AUTHORITIES

Several related statutory authorities govern this Plan. These include the Clean Air Act, the Clean Water Act, the Endangered Species Act, the Refuge System Improvement Act, the National Environmental Policy Act, and the Wilderness Act. Policy of the U.S. Department of the Interior states that managers of Refuge lands with vegetation capable of sustaining fire will develop a Fire Management Plan (FMP) (620 DM 1). The Fish and Wildlife Service's Fire Management Handbook (621 FW 1.3.E) states that, "An approved fire management plan must be in place for all lands with burnable vegetation." This Environmental Assessment (EA) explores the various alternatives in which Service Policy can be carried out and analyzes the foreseeable impacts associated with an integrated fire management program. For ease of reference, these Authorities are listed below.

1. Protection Act of September 20, 1992 (42 Stat. 857; 16 U.S.C. 594).
2. McSweeney-McNary Act of 1928 (45 Stat. 221; 16 U.S.C. 487).
3. Economy Act of June 30, 1932 (47 Stat. 417; 31 U.S.C. 1535).
4. Taylor Grazing Act of June 28, 1934 (48 Stat. 1269; 43 U.S.C. 315).
5. O. and C. Act of August 28, 1937 (50 Stat. 875; 43 U.S.C. 1181e).
6. National Park Service Acts as amended (67 Stat. 495; 16 U.S.C. 1b).
7. Federal Property and Administration Services Act of 1949 (40 U.S.C. 471; et seq.).
8. Reciprocal Fire Protection Act of May 27, 1955 (69 Stat. 66; 42 U.S.C. 1856a).
9. National Wildlife Refuge System Administration Act of 1966 as amended (80 Stat. 927; 16 U.S.C. 668dd through 668ee).
10. Alaska Native Claims Settlement Act of December 18, 1971 (85 Stat. 688; 43 U.S.C. 1601).
11. Disaster Relief Act of May 22, 1974 (88 Stat. 143; 42 U.S.C. 5121).
12. Federal Fire Prevention and Control Act of October 29, 1974 (88 Stat. 1535; 15 U.S.C. 2201).
13. Federal Land Policy and Management Act of 1976 (90 Stat. 2743).
14. Federal Grant and Cooperative Agreement Act of 1977 (P.L. 950224, as amended by P.L. 97-258, September 13, 1982 (96 Stat. 1003; 31 U.S.C. 6301 through 6308).
15. Alaska National Interest Lands Conservation Act of December 2, 1980 (94 Stat. 2371).
16. Supplemental Appropriation Act of September 10, 1982 (96 Stat. 837).
17. Wildlife Suppression Assistance Act of 1989 (P.L. 100-428, as amended by P.L. 101-111, April 7, 1989).
18. Indian Self-Determination and Education Assistance Act (PL 93-638 as amended).
19. National Indian Forest Resources Management Act (P.L. 101-630, November 28, 1990).
20. Tribal Self-Governance Act of 1994 (P.L. 103-413).
21. Department of the Interior and Related Agencies Appropriations Act (P.L. 103-132).

II. COMPLIANCE WITH U.S. FISH AND WILDLIFE SERVICE POLICY

Seney NWR was established in 1935 by Executive Order under the Migratory Bird Conservation Act for the protection and production of migratory birds and other wildlife. The Refuge encompasses approximately 95,238 acres; 25,150 acres comprise the Seney Wilderness Area in which is contained the Strangmoor Bog National Natural Landmark.

While management for migratory birds is paramount, the Refuge provides habitat for a diversity of wildlife species, both migratory and non-migratory. Approximately 20 species of herptofauna, 48 species of mammals, 26 species of fish, and over 200 species of birds have been documented on the Refuge. Many of these species are Conservation Priorities for Region 3 (**Appendix B**).

The wide array of both year-round residents and migratory species found at the Refuge is due to the varied habitat types found in the open water/wetland/forest complex. The mix of forest types and age classes and emergent marsh and sedge meadows contributes to the Refuge's biodiversity. As a native ecosystem process, fire maintains successional habitats required by many wildlife species of management concern (e.g., sandhill crane, (*Grus canadensis*); yellow rail, (*Coturnicops noveboracensis*); see Stenzel 1982 and Burkman 1993).

Fire is also an important restoration tool. Throughout the National Wildlife Refuge System, ecological restoration efforts have increased in number and scope. A shift in management focus is in part due to the National Wildlife Refuge System Improvement Act of 1997. This legislation directed the Secretary of the Interior to "ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans."

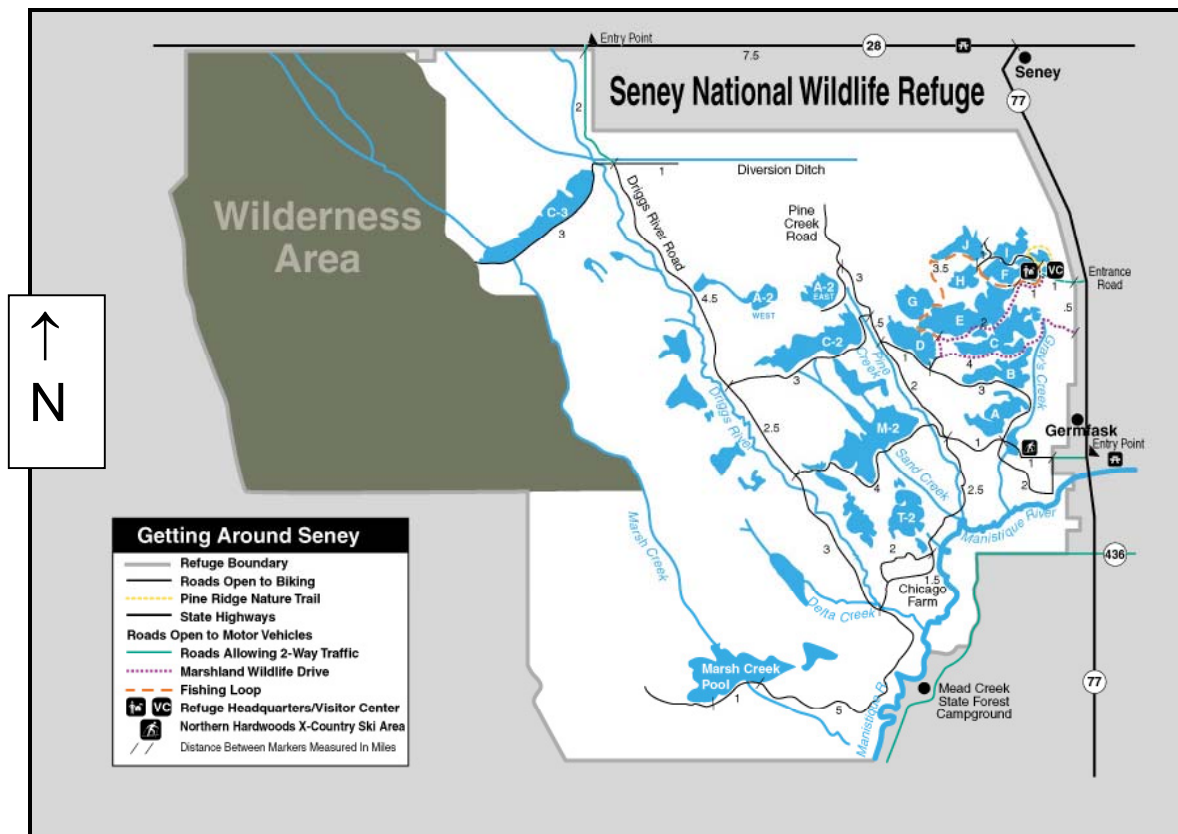
To comply with the Act, the U. S. Fish and Wildlife Service enacted policies that make reference to restoring "lost or severely degraded elements of integrity, diversity, (and) environmental health at the refuge scale" and favoring "management that restores or mimics natural ecosystem processes of function to achieve refuge purposes." In total, policy identified "the highest measure of biological integrity, diversity, and environmental health (as)...those intact and self-sustaining habitats and wildlife populations that existed during historic conditions."

III. DESCRIPTION OF REFUGE

A. LOCATION

Seney NWR is located in the east-central portion of Michigan's Upper Peninsula equidistant from Lake Superior and Lake Michigan. The Refuge encompasses 95,238 acres; the Seney Wilderness Area and Strangmoor Bog National Natural Landmark encompass 25,150 acres or 26 percent of the Refuge. Located in northeastern Schoolcraft County, the Refuge is removed from major population centers; the three nearest major communities are each more than 80 miles away (Fig. 1).

Figure 1 - Seney National Wildlife Refuge



B. HISTORY

Before its establishment, the forests and soils of the Seney area and surrounding Schoolcraft County were exploited to a considerable degree starting in the late 1800's. Early timber cutting favored the best stands of white pine, followed by "high-grading" in the red pine and hardwood-hemlock stands. Slash fires fueled by logging debris occurred annually with most areas burning time and time again. As sawtimber diminished, efforts were shifted to cutting of poles, posts, ties and pulp. At this time, an attempt was made to settle cut-over lands and develop farming communities.

By 1912, drainage of the Seney Swamp was underway. Imperfect drainage of peat soils, poor soil fertility, and the short growing season made the farming venture a disaster and most lands were tax-reverted to the State of Michigan by the early 1930's. Seney NWR was then established in 1935 by Executive Order under the Migratory Bird Conservation Act for the protection and production of migratory birds and other wildlife. The Refuge now receives nearly 100,000 visits from the public each year and a variety of wildlife-oriented activities and programs are available.

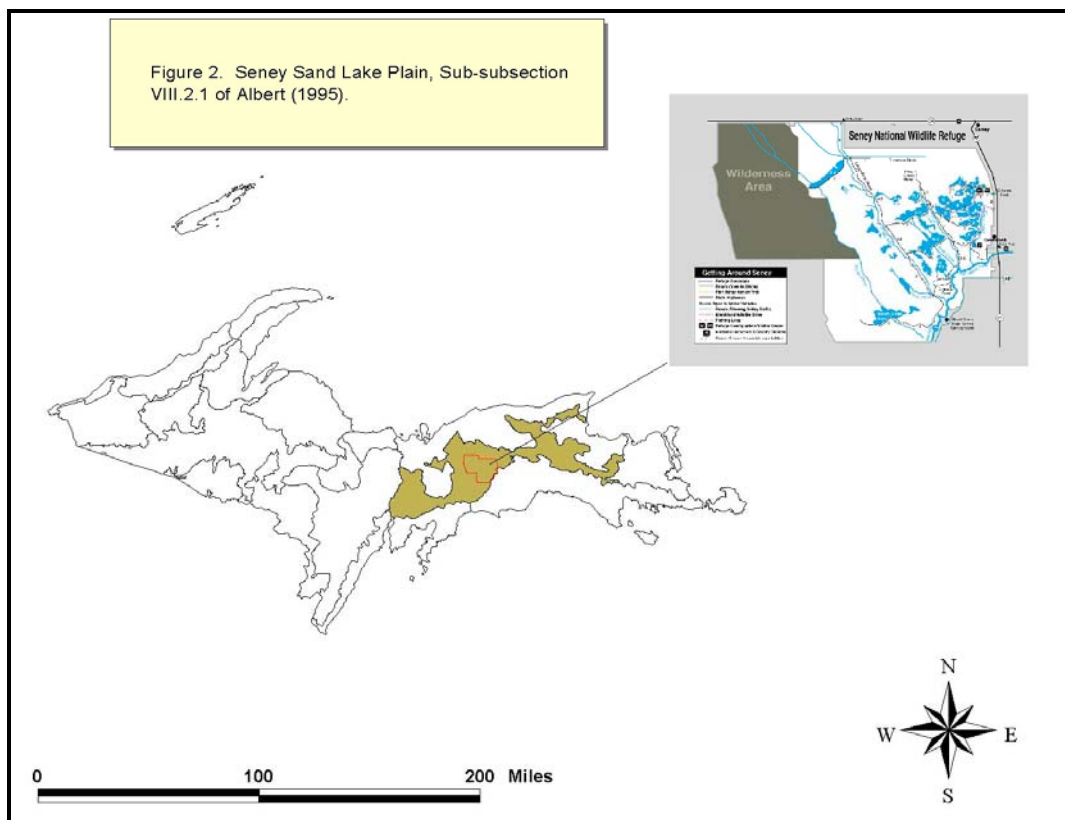
C. CLIMATE

The climate of Seney NWR is considerably lacustrine influenced by its close proximity to Lakes Superior and Michigan. The most common spring through early fall winds are from the southwest and northwest and average approximately 10 m.p.h. Average daily humidity during spring and fall burning seasons varies from 50 to 60 percent. Temperature extremes are approximately -35 degrees Fahrenheit and 98 degrees Fahrenheit. Burning season temperatures average 56 degrees Fahrenheit. Precipitation occurs throughout the year, with June being the wettest month and March the driest on average. Average annual precipitation is approximately 27 inches and average annual snowfall is approximately 123 inches. During spring and summer months, on-shore breezes cause frequent afternoon thunderstorms. Lightning strikes are common during such storms, probably due to the relative lack of topography in the area. Growing season evaporation averages 25.1 inches. It is expected that only during 5 percent of the time will drought indices (e.g., Keetch-Byram Drought Index) reach extreme severity levels. The growing season averages 119 days.

D. TOPOGRAPHY AND GEOLOGY

According to the regional landscape classification system of Albert (1995), Seney NWR lies within the Seney Sand Lake Plain (Sub-Subsection VIII.2.1, **Fig. 2**). This unit is characterized by landforms of lacustrine origin with broad, poorly drained embayments containing beach ridges, swales, dunes, and sandbars.

Figure 2 - Seney Sand Lake Plain



The lands comprising Seney NWR present an area of seemingly little geological variation in comparison with more scenic areas along the shores of Lake Superior and Lake Michigan. Although relatively little topographic relief exists on the Refuge (elevation varies from approximately 803 feet in the northwest to 640 feet in the southeast), the broad flat lands of the Refuge reflect a subtle, but highly complex, geologic history.

Between 10,000 and 10,500 years ago, the "Valders" pro-glacial lakes in the Superior basin drained southward across the Upper Peninsula. At about the latter date, the Valders ice border was located along the southern shore of Lake Superior allowing meltwater to drain southward across what is now the Refuge. During this period of time, the present land surface appears to have been sculptured. At least two phases of drainage seem to be visible in the surface patterns of the area. The first of these is a broad channel eroded into earlier outwash deposits that carried meltwaters from the area of Long Lake southward through what is now termed the "Strangmoor Bog." Throughout the length of this channel now occur linear landforms composed of sandy sediments.

A second generation of outwash channels is visible as linear peat-filled depressions trending northwest-southeast across Seney NWR. These landforms are now considered to be a unique patterned bog topography and are prominently visible near Creighton and in the Refuge lands west of the Driggs River (Seney Wilderness Area). Finally, the present natural drainage patterns present a still different orientation and one that transects the above peat-filled channels. In the Seney area, the Driggs River best exhibits this pattern.

Since 10,500 years ago, the Seney area has been a site for marsh development. At present, from 3 to 9 feet of peat blanket the area. Among the more conspicuous landforms in the area are parabolic sand dunes, which have spread from northwest to southeast across the Refuge in a disjointed pattern. These landforms indicate arid conditions in the area, which allowed for the disruption of vegetation developed upon the surrounding sand and gravel deposits. At the same time, prevailing northwest winds winnowed the exposed fine to medium grained sands from the earlier outwash sediments and gave rise to the present dune topography.

E. SOILS

Within the Seney Sand Lake Plain, 100 to 200 feet of glacial drift generally cover the bedrock. The soils on the Refuge are generally level to somewhat sloping mucks, peats and sands. The dominant mucks are interspersed with sand ridges and knolls in such an intricate pattern that the two soils have been mapped together as a complex of Carbondale muck and Rubicon sand (dune phase). The muck has accumulated on the wet sandy plain at a depth of 3 to 9 feet. The material is a dark brown, spongy, felt-like muck, which is more decomposed than peat soils and in general contains a higher percentage of mineral matter. The natural drainage is very poor in the mucks and excessive in the sands on the ridges and knolls. This complex covers the majority of the Refuge.

A large area of Dawson and Greenwood peats exists in the central portion of the Refuge. These level, very poorly drained soils are composed of brown or yellow-brown mixed fibrous and woody material. Very little decomposition has taken place in these soils in comparison to the muck soils. At depth of 1 to 2 feet, raw yellow peat or muck underlies the peat. Very little decomposition has taken place in the areas of yellow peat. The water table is at the surface most of the year. Areas of Carbondale and Tawas mucks interrupt the peats on the Refuge. Wet sands underlie the entire area.

Along the Manistique River Valley, Driggs River, and the other tributaries draining the Refuge, the soils are predominately sands and sandy loams. These soils are well or excessively drained and lie on slopes that are level to steeply sloping. The soil surface consists of forest litter, underlain by gray sandy loam or fine sandy loam, with coarser sand beneath the loam.

Under the former Soil Conservation Service Capability Class system, most of the Refuge would be Class V, wet soils. The wet sandy areas are Class II, VI, and VIII, while the better-drained areas are Class II and III. Only small areas along the Manistique River and along the western border of the Refuge are suitable for farming.

F. WATER

The major trend has been for streams to cross the Senej area at a north-south to northwest-southeast trajectory and to join the northeast-southwest trending Manistique River. This stream channels runoff into Lake Michigan at the town of Manistique. The Manistique River valley, for example, marks an approximate geologic boundary between eroded lowlands of the Senej Marsh and the uplands of earlier glacial outwash deposits to the east. Meltwater from the Valdres ice front apparently channeled water into the pre-existing Manistique River, allowing for the erosion of earlier outwash deposits in the Senej area and the removal of these sediments through the Manistique River.

Twenty-one man made pools have been constructed on the Refuge and they impound 6,495 acres of open water (**Table 1**). These pools were created by an intricate dike system that catches water as it flows through the Refuge. Because the general topography of the Refuge is flat with a natural drainage to the southeast, water flows from one pool to another without the aid of pumping stations. The principle source of water for these pools is several streams and ditches that flow into the Refuge from the north.

Table 1 - Pool Size at Senej National Wildlife Refuge by Unit

Unit	Pool	Acreage (Open Water)
1	Show Pools	57
	Upper Goose Pen	27
	Lower Goose Pen	93
	A-1	259
	B-1	243
	C-1	302
	D-1	197
	E-1	490
	F-1	258
	G-1	202
	H-1	111
	I-1	129
	J-1	214
Unit 1 Total = 2,582		
2	A-2	282
	C-2	501
	M-2	863
	T-2	410
Unit 2 Total = 2,056		
3	C-3	702
	Marsh Creek	950
	Delta Creek	50
	Spur Pools	155
Unit 3 Total = 1,857		
Total Pool Acreage		6,495

Water levels within the pools can be regulated to accomplish certain objectives. The water level of each pool is controlled independently of the others by regulating the water control structure. When waterfowl are nesting, water levels are kept high to discourage terrestrial predators. Through the summer and fall, levels are drawn down to promote growth of aquatic plants. During winter months, water is manipulated to either maintain fish populations or to reduce them. The

average depth of water in the pools is between 2 and 3 feet and seldom exceeds 5 feet. The pools are composed predominately of fibrous peat and sand (along dikes and islands).

The Manistique River from Germfask flows south through the southeastern corner of the Refuge. The river at this location is about 50 to 100 feet wide and varies from 2 to 6 feet in depth. The streambed is composed mostly of sand and some gravel. Stream flow is rather placid with few riffles located along the river course.

The highest average discharge of water in one day recorded on the Manistique River near Manistique, Michigan, was 16,500 cubic feet per second (cfs) in 1960. Climatic conditions in the Upper Peninsula result in the high water levels occurring during spring snowmelt. One hundred-year runoff conditions would be 16,295 cfs, with a probability of exceedence of 10 percent. Lowest daily discharge in the Manistique River near Manistique was 290 cfs and this value coincides with the driest month on record for the area (October 1947). Control of pool elevations on the Refuge may cause fluctuations in the tributaries that run through the Refuge in seasons other than those normally expected.

Recently, a large-scale Marsh and Walsh Creek Restoration Project was initiated at the Refuge. The purpose of the Project is to restore the hydrology and ecological integrity of the wetlands and streams that have been affected by the drainage of Walsh Ditch. The Walsh Ditch drains wetlands for 6 miles within the Seney Wilderness Area. This restoration was compelled by mandate of the Wilderness Act of 1964 and the Improvement Act of 1997. Wilderness is defined as:

...an area where earth and its community of life are untrammelled by man, ... an area of undeveloped Federal Land retaining its primeval character and influence without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable ...

G. AIR

The Seney Wilderness was designated as a Class I Area in 1977 by the Federal Clean Air Act giving the area special protection from air pollution impacts. The Refuge has the responsibility to protect air quality related values in the area from adverse impacts from human-caused air pollution. Air quality related values include flora, fauna, soil, water, visibility, odor and cultural and archeological resources. Despite this protection, the Service has documented impacts to Refuge resources from air pollution, primarily from sources outside the refuge. For example, Refuge surveys conducted from 1999-2001 found injury to vegetation from ozone pollution formed from industry, power plant, and auto emissions. Power plants and other sources also release mercury, which bioaccumulates in fish and wildlife at the Refuge. In addition, visibility at the Refuge is often impaired by fine particulate pollution. A review of air quality issues pertaining to the Refuge can be found in the Air Quality Briefing, Seney NWR (2001).

The Clean Air Act, as amended, requires the Refuge to comply with all Federal, state, and local air quality standards and regulations to the same degree as any non-Federal entity. These standards and regulations impact how the Refuge manages fire. The primary combustion products emitted by wildland fires include carbon dioxide, water vapor, carbon monoxide, particulate matter, hydrocarbons, and nitrogen oxides. Some of these combustion products are considered to be air pollutants and can adversely affect human health and air quality related values. For example, small particulate matter can impact visibility by scattering and absorbing light, affecting how far and how well we can see. However, wildland fires are infrequent and relatively short in duration and, as a result, their impact to visibility is also limited to short periods of time. In addition, the Refuge uses smoke management techniques, such as scheduling prescribed fires during those periods when fuel and meteorological conditions will minimize air quality impacts.

Monitoring by the nationwide IMPROVE (Interagency Monitoring of Protected Visual Environments) network has shown that, in general, most visibility impairment at Class I areas is caused by sources outside the Class I areas, including power plants, industry, and autos. In 1999, the Refuge joined the IMPROVE network and is now collecting information to determine the causes of visibility impairment at Seney. In addition, an automatic camera continuously records visibility conditions at the Refuge. This information is then updated every 15 minutes at www.mwhazecam.net. Real-time particle measurements from the Refuge are also available at the website.

The Service is working with States, Tribes, and the Environmental Protection Agency and others to protect and improve visibility in Seney and other Class I areas. This effort is a result of the EPA's 1999 regional haze regulations, which require States to develop plans to make progress towards the national visibility goal of preventing any future and remedying any existing visibility impairment due to human-caused pollution in Class I area. The Service, States, Tribes, and EA recognized that fire is a natural part of the ecosystem. As such, it is likely that emissions from wildfire and some prescribed will be considered as part of the natural visibility background. The Service along with States, Tribes, EPA and others are participating in regional planning and analysis which will likely result in emissions controls programs to protect and improve visibility in Class I areas throughout the country.

H. COVER TYPES

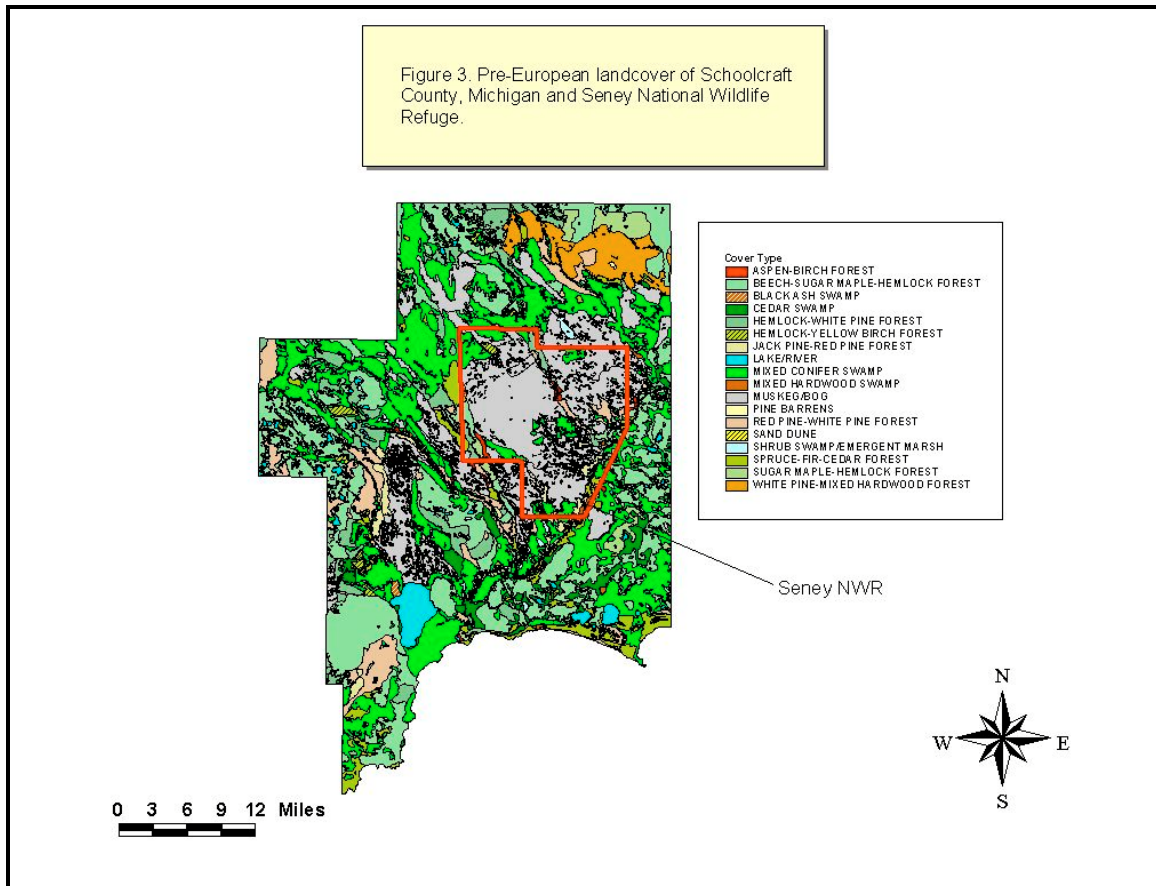
Pre-European forests consisted of large tracts of sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), eastern hemlock (*Tsuga canadensis*), yellow birch (*Betula alleghaniensis*) and red and white pine (*Pinus resinosa* and *Pinus strobus*). Fire, which periodically altered this association, allowed successional species, particularly white pine, paper birch (*Betula papyrifera*), and aspen (*Populus* spp.) to become abundant. Swamp forests were dominated by black spruce (*Picea mariana*) and balsam fir (*Abies balsamea*) (**Fig. 3**).

During the late 19th century the pine forests (and, to a lesser extent, the deciduous forests) were heavily logged. The swamp conifers, on the other hand, were logged only to a limited extent, as access to this resource was difficult. Early logging was usually associated with uncontrolled fires that burned much of the soil humus needed for rapid forest regeneration. As a result, much of the forest re-growth and maturation (i.e., closing of forest openings) has occurred only in recent years. Large areas of present vegetation consist of the aspen-birch and white-red-jack pine types (*Pinus banksiana*)

Due to many parameters, the present condition of the second growth forest is quite variable. On good upland sites there is an abundance of sugar maple, beech and yellow birch. Swamp forests, however, presently cover large areas of wilderness. Refuge visitors only infrequently use these areas. A brief discussion of major community types is given below, see **Table 2** and **Fig. 4** for major land cover types.

The white, red, and jack pines are major constituents of the **upland coniferous forest community**. Associated species vary but would include primarily aspen, red maple (*Acer rubrum*), and others. Understory species include wild raisin (*Viburnum cassinoides*), bracken fern (*Pteridium aquilinum*), hazels (*Corylus* spp.), wild strawberry (*Fragaria virginiana*), princess pine (*Lycopodium* spp.), blueberry, and huckleberry (*Gaylussacia baccata*). Lichens, grasses and sedges are also represented, especially in the second growth aspen stands. White pine was a dominant forest component in the Seney area before logging and burning converted thousands of acres to second growth aspen and jack pine. This forest type still exists, but is scattered throughout Seney NWR.

Figure 3 - Pre-European Vegetation



The **upland hardwood forest community** is commonly referred to as the broadleaf forest, northern mesic, northern hardwood, or hardwood-hemlock forest, and is comprised of sugar maple, American beech, and yellow birch, with eastern hemlock as an important associate. Other associates include American basswood (*Tilia americana*), black cherry (*Prunus serotina*), paper birch, white spruce (*Picea glauca*), and balsam fir. When the tree canopy closes in, the herbaceous plants disappear. However, in suitable areas, several shrubs (e.g., Canada Yew (*Taxus canadensis*), elderberry (*Sambucus* spp.), leatherwood (*Dirca palustris*) and hazel) and other plants (e.g., partridge berry (*Mitchella repens*), bunchberry (*Cornus canadensis*), twinflower (*Linnaea borealis*), baneberry (*Actaea* spp.), trillium (*Trillium* spp.)) could occur. This forest type is located in the southwest section of the Refuge.

The **lowland conifer forest community** represents a combination of two basic forests: the spruce-fir or boreal forest, and the northern lowland or swamp conifer forest. White spruce and balsam fir comprise the majority of tree species in this forest type, while white cedar (*Thuja occidentalis*), black spruce and tamarack (*Larix laricina*) constitute the majority in the second forest type. Typical associates include paper birch, red maple, and alder (*Alnus* spp.). Common shrubs include round-leaved dogwood (*Cornus rugosa*), hazel, honeysuckle (*Lonicera* spp.), thimbleberry (*Rubus parviflorus*), and blueberries. Other understory plants include sweet gale (*Myrica gale*), leatherleaf (*Chamaedaphne calyculata*), bog rosemary (*Andromeda glaucophylla*), and cranberry (*Viburnum* spp.). However, when the canopy is closed little understory exists.

Table 2 - Approximate Acreage of Major Land Cover Types

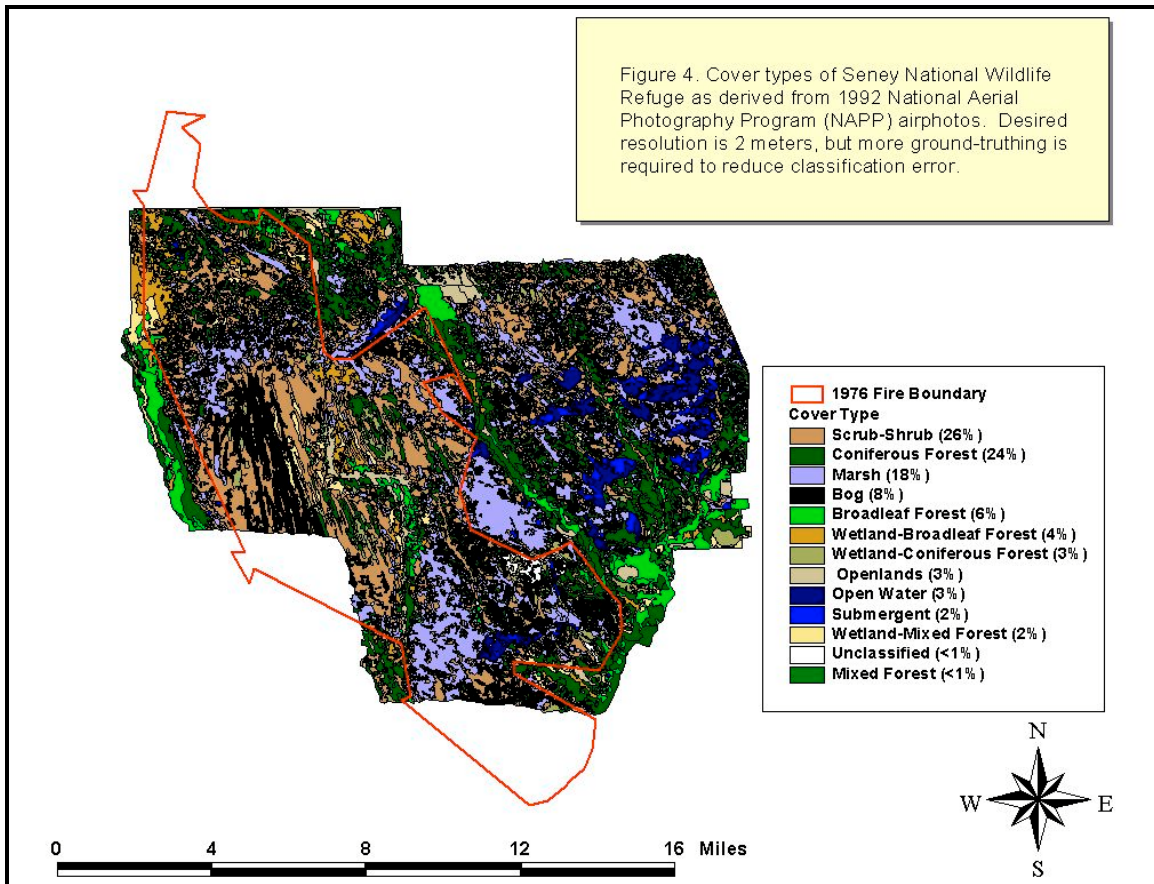
Cover Type	Approximate Acreage	Percent
Shrub-Scrub	24,755	26
Coniferous Forest	22,851	24
Marsh	17,138	18
Bog	7,616	8
Broadleaf Forest	5,713	6
Wetland Broadleaf Forest	3,808	4
Wetland-Coniferous Forest	2,856	3
Openlands	2,856	3
Open Water	2,856	3
Submergent	1,904	2
Wetland Mixed Forest	1,904	2
Mixed Forest	478	<1
Unclassified	503	<1
Total	95,238	100

Note: Above tabular information derived from interpreted 1992 National Aerial Photography Program (NAAP) aerial photos. Although desired minimum resolution is approximately 2 acres, considerable ground-truthing is necessary to enhance quality and to reduce classification error. Due to the need to lump and/or split categories, these cover types differ from the community types discussed in this section.

The **peatland community** is one of the most significant features of the Refuge. Within this area, pine knolls, bog forests, bog hollows, and bog ridges all occur in a unique association. The pine knolls are composed of sand dunes and the following plants are commonly found on them: white and red pine, red maple, paper birch, white cedar, black spruce, huckleberry, and bunchberry (*Cornus canadensis*). The bog forest is usually located downslope from these knolls and plants commonly found here are tamarack, sphagnum moss, willows (*Salix* spp.), sedges (*Carex* spp.), red maple, labrador tea (*Lecum groenlandicum*), royal fern (*Osmunda regalis*), and dwarf blackberry (*Rubus allegheniensis*). The bog hollows will support bog rosemary, cranberry, pitcher plant (*Sarracenia purpurea*), horsetail (*Equisetum*), cottongrass (*Eriophorum spissum*), and three-way sedge. Finally, the bog ridges are composed of bog birch (*Betula pumila*), leatherleaf, bog rosemary, cranberry, blue flag (*Iris versicolor*), bluejoint (*Calamagrostis canadensis*), and wintergreen (*Gaultheria procumbens*).

Shrub swamps, meadows and marshes are also present on the Refuge. **Primarily alders represent the shrub swamp community.** Other species include red osier dogwood, willow, meadowsweet (*Spiraea latifolia*), current (*Ribes* spp.), bedstraw (*Galium* spp.), joe-pye-weed (*Eupatorium* spp.), goldenrod (*Solidago* spp.), and marsh fern (*Thelpteris palustris*). **Meadows** contain many different herbaceous species and the composition would be related to moisture, exposure, and soil conditions. **Marshes** provide habitat for grasses, sedges, rushes (*Juncus* spp.), marsh horsetail (*E. palustre*), bladderwort (*Utricularia* spp.), cattails (*Typha* spp.) and bottle gentian (*Gentiana andrewsii*).

Figure 4 - Cover Types - Seneý National Wildlife Refuge



I. HISTORICAL AND ECOLOGICAL ROLE OF FIRE

Fire functions to perpetuate forests, prairies, and wetlands in the Upper Great Lakes region and thus is important in maintaining and restoring populations of associated wildlife species, many of which are seriously declining nationwide (Niemi and Probst 1990, Loope 1991, Albert 1995). At Seneý NWR, fire is considered a natural disturbance mechanism and the communities in which fire is most vital are the shrub-scrub (comprising 26% of the Refuge), coniferous forest (24%), marsh (18%), and openlands (3%). All told, up to 90% of the Refuge land area could be considered to be fire dependent.

Ecological processes affected by fire include succession, surface erosion, vegetation recovery rates, and potential productivity. Fire also affects soil, water, and air quality. Although few wildlife species are considered fire obligates, many species benefit from fire indirectly. Generally managers should consider how species populations at local scales are influenced by the way in which fire alters habitat. For example, although Kirtland's warbler can nest and reproduce successfully in conifer stands not produced from wildfire, fire-induced stands within the region have higher densities of this species. Moreover, fire typically produces a mosaic of burned and unburned patches, the juxtaposition of which depend on characteristics of the fire, soil moisture, and weather. The connectivity and size of these patches influences species composition, abundance and movement patterns within and between patches. This heterogeneity is almost impossible to mimic without fire as a management tool.

In wetland systems, fire is especially important during times of drought when water levels are reduced. In areas comprised of emergent vegetation and shrubs, fire can be used to reduce woody cover and promote seed bearing plants used by waterfowl and other herbaceous vegetation used by

a wide range of non-game species. In forested ecosystems, fire promotes early successional communities and provides structural complexity by producing openings interspersed by standing live and dead trees (snags).

J. REFUGE FIRE HISTORY

Based on General Land Office (GLO) Notes, Albert (1995) states that fire was a regular disturbance of the native ecological communities of the Upper Peninsula. In regards to the communities of Seney NWR, prior to European settlement fires occurred regularly on both the extensive peatlands and on the dunes within the peatlands approximately every 29 years (W. Loope, Pictured Rocks National Lakeshore, *Pers. Comm.*). Most of the larger fires that occurred during the late 19th and early 20th centuries were associated with extensive logging and residual slash.

The first recorded regional fire indicated by the GLO notes was in October of 1871 when approximately 50,000 acres of land burned in the Upper Peninsula. Between 1883 and 1885, large fires occurred throughout the central and eastern Upper Peninsula. In 1902, a fire occurred near Seney and spread west to the town of Munising and north to Grand Marais. This fire is thought to have been particularly intense and destructive. Another fire occurred the following year and again in 1905 and 1906. Over the next twenty years or so, large fires fueled by the slash left behind by logging occurred several times within the region (**Table 3**). In many years (e.g., 1912, 1918, 1920, 1925, 1930, and 1933), fires were reported to be so common in the eastern Upper Peninsula that smoke hung over much of the area throughout the months of July and August.

Thirty-three wildfires were documented on the Refuge during the period 1936 to 2001, with the average occurrence of fire approximately every 2 years. The first wildfire documented in annual reports took place in 1944 and was caused by lightning. All told, this fire occurred over approximately 500 acres of willow shrubs and marsh vegetation.

Table 3 - Reported Fire History for the Seney Area for the Period 1915-1936

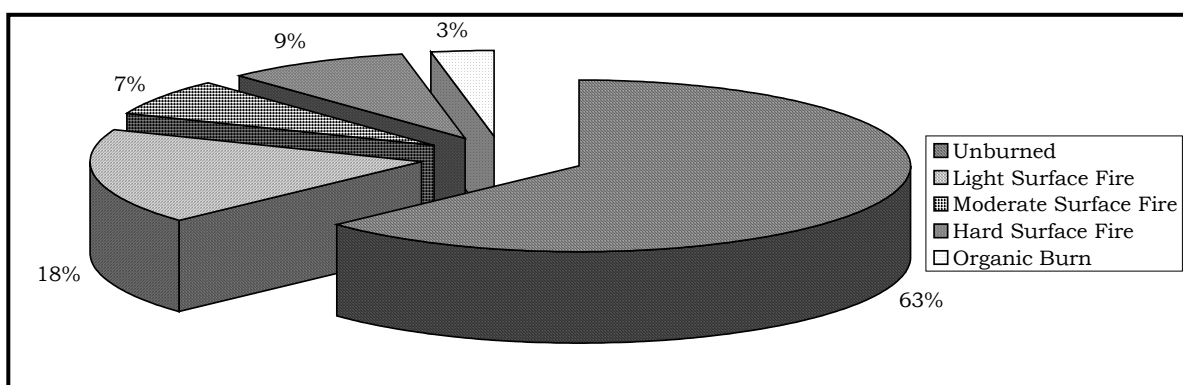
Data is derived from numerous sources compiled by Burkman (1991).

Year(s)	State(s) or Region	Approximate Acres
1915	Michigan and Wisconsin	203,000
1917	Upper Peninsula	70,000
1918	Wisconsin and Upper Peninsula	100,021
1919	Upper Peninsula	418,000
1922	Michigan	7,750
1923	Michigan, Minnesota, and Wisconsin	1,490,000
1924	Michigan, Minnesota, and Wisconsin	487,000
1925	Schoolcraft County	16,640
1930	Seney area	60,936
1931	Seney area	11,130
1936	Seney area	9,343

The Walsh Ditch Fire of 1976, which occurred on the Refuge, has had a long-term impact on the way wildfire is thought of by natural resource managers and wildfire fighters in the State of Michigan. By the time the last flame was put out, this fire became the largest to have ever occurred on the Refuge. All told, the fire spread over 100 square miles, burned for 6 weeks, required an interagency fire-fighting force of more than 1,200 to achieve containment, and caused considerable alteration to the local vegetation cover. The fire occurred in primarily northern mixed forest stands and string-bog habitat (Seney Wilderness Area, **Fig. 4** above).

The Walsh Ditch Fire began during the driest year on record since 1872. The weather station in Marquette recorded an 8-inch rainfall deficit, and in the eastern Upper Peninsula deficits in the range of 9 to 12 inches were recorded. The water table at the Refuge was down approximately 1 foot and the fire danger was listed as "extreme" by the end of July. On July 30, a lightning strike ignited a fire in T44N-R15W, Section 1. By August 3, the fire spread to 200 acres and by the 12th to 1,500 acres. On August 23, strong northwest winds, warm temperatures, and low humidity resulted in the fire moving 9 miles and encompassing 20,000 acres by the next day. By the 29th, the fire was determined to have burned 30,850 acres, but the southern point of the fire was considered "contained." By the 30th, the fire moved northwest, and by September 3rd the fire had reached 49,000 acres. On September 7th, the fire was thought to be "contained" after 64,000 acres burned. At this point, the perimeter of the fire encompassed 54,000 acres of the Refuge. The fire was declared "controlled" on September 9th, but over the next month strong winds and low humidity flamed the fire a number of times. According to Anderson (1982), of the 76,300 acres that were within the fire perimeter on the Refuge, only 35,623 (37%) actually burned to varying degrees (Fig. 5).

Figure 5 - Breakdown of 1976 Walsh Ditch Fire at Sene National Wildlife Refuge by acres and type of burn (adapted from Anderson 1982)



During the period 1977 to 2001, a number of fires occurred on the Refuge. The largest fire burned approximately 3,000 acres during August of 1983. This fire began during a severe drought and was first detected on August 14th. It was declared "out" on October 3rd.

Wildfires at Sene NWR have started in a number of ways. Lightning strikes have caused 58% of all fires with prescribed fires and human activity the cause of the other 42% (Table 4).

**Table 4 - Known Wildfire History at SENEY National Wildlife Refuge (1944-2001)
by Cause and Year**

Name/Location	Cause and Year			
	Lightning	Human Activity	Escaped Prescribed Fire	Other
Diversion Ditch	1944			
C-2 Dike		1946		
SE Corner			1947	
Marsh Creek				1954 (Unknown)
Unit III	1955			
Unknown	1955			
Unknown	1955			
Conlon Area				1962 (Unknown)
A-2/Pine Creek	1962			
Chicago Farm			1963	
Delta Creek	1964			
Walsh Ditch	1964			
Entrance Area				1966 (Downed Powerlines)
M-2	1966			
Driggs River Rd.	1966			
Wilderness Area	1967			
Wilderness Area	1970			
Walsh Ditch	1976			
Pine Creek Road	1976			
Manistique River		1979		
Manistique River		1979		
Marsh Creek Area		1983		
Manistique River		1983		
Mead Creek	1984			
C-3	1987			
North Marsh Creek	1988			
Coyote	1988			
Harbor Island	1991			
J-G Spillway			1991	
Conlon Farm		1991		
Sub-Headquarters		1997		
Farm				
A2	1998			
River Road		1998		
Total (Number)	19	8	3	3
Total (Percent)	58	24	9	9

K. FIRE EFFECTS

The Walsh Ditch Fire provided a rare opportunity to investigate the landscape-scale effect of fire. Using a paired sampling scheme to compare soil, water, and wildlife characteristics of burned and unburned areas, Anderson (1982) concluded that although the Fire had little effect on most abiotic characteristics of the Refuge it had dramatic effect on biotic features. Basic soil data collected after the Fire showed few differences of ecological significance between burned and unburned areas. The Fire did not seem to alter any soil chemistry; only minor impacts occurred to the mineral soils. In regards to water quality, the interrupted pattern and low intensity of fire along the watercourses mitigated the potentially deleterious effects of fire on aquatic resources.

Although not discussed to any great degree by the author, smoke was a problem for local citizens and did create localized air pollution issues.

Vegetation structure was the major wildlife habitat component affected by fire and was altered most drastically in the peatland areas of the Refuge. On the treeless bog strips, burn scars will likely remain for many years. The bog forests also showed considerable change since most of this cover type was burned to the ground. On many of these sites, aspen, jack pine, and blueberry became established in a relatively short period of time and at present dominate these areas.

In general, the effects of fire on wildlife at Seney NWR are considered to be favorable. Some of the major wildlife objectives of Seney NWR are to a) maintain a healthy population of nesting waterfowl, and b) to provide habitat for maintaining biodiversity. Fire is an important tool for meeting these objectives. The patchy nature of the Walsh Creek Fire increased the overall wildlife diversity of Seney NWR by creating a more diverse landscape mosaic. Because the Fire did not burn a continuous block of land, many wildlife species likely found refuge in the scattered areas not touched by the fire. Generally, the burned areas attracted larger numbers of some small mammals and bird species along with their predators. Although some forest interior-inhabiting bird species were displaced, existing habitat for these species was still available elsewhere in the Refuge.

In the future, fire should be used to create and maintain quality early successional habitat within both terrestrial and wetland ecosystems by reducing woody vegetation cover. Fire will promote breeding habitat comprised of grasses and sedges for a wide range of wetland obligate species (e.g., waterfowl, yellow rail, sedge wren (*Cistothorus palustris*), Le Conte's sparrow (*Ammodramus leconteii*). Within xeric terrestrial ecosystems, fire and other silvicultural tools can be used to maintain habitat for other openland species of conservation concern (e.g., sharp-tailed grouse, upland sandpiper). In red and white pine ecosystems, fire use may promote savanna-like ecosystems whereas in jack pine-dominated sites the use of fire should promote a patchy distribution of regenerating jack pine and openlands. Such conditions may favor species such as Kirtland's warbler (*Dendroica kirtlandii*) as well as a number of winter finches that are in global decline. Fire can also promote vigorous aspen regeneration where desired (see Niemi and Probst 1990).

To assess the effectiveness of fire management, vegetation monitoring could be linked to studies of bird and mammal use and abundance so as to measure the effect of fire at different levels in an ecosystem. Because most birds are relatively easily and affordably assessed and because most species have relatively high habitat specificity, they can be used as good indicators of ecological condition. Thus, an assessment of bird use can be a good measure of the effectiveness of fire on broader ecological patterns and processes.

IV. FIRE MANAGEMENT GOALS AND OBJECTIVES

In the following discussion of fire specific goals and objectives, goals are considered to be general, long-range aspirations of the Refuge; objectives are specific, field-observable conditions that specific fire plans are designed to achieve in order to enhance the goals. The goals and objectives have been created within the context of the “Vision Statement” for Seney NWR:

Maintain a complex mosaic of habitats that supports an array of both wetland and upland wildlife species. Plant succession will be actively managed to maintain a wide range of conditions.

A. FIRE MANAGEMENT GOALS

- Protect life, property, and other identified resources in need of protection.
- Use fire as a tool to accomplish resource management objectives of restoring environmental health and ecological integrity.
- Restore and maintain fire-dependent early successional communities that existed historically.
- Improve the status of priority wildlife species that benefit from naturally occurring wildland fire.
- Maintain Wilderness Area standards.

B. FIRE MANAGEMENT OBJECTIVES

(SEE SECTION IX FOR OBJECTIVES FOR EACH FIRE MANAGEMENT UNIT)

- Protect important scientific, cultural, historic, prehistoric, and scenic resources, private lands, and visitor, administrative, and other facilities/structures by reducing fuel load levels in adjacent areas. This work will be integrated into an ecological approach to habitat management with the consideration of spatial aspects (e.g., connectivity).
- Maintain and restore historic vegetation structure, composition, and biodiversity through the use of prescribed fire and a Fire Use Program. This involves maintaining and restoring sedge-dominated conditions and reducing encroaching woody vegetation by Fire Use or prescribed fire. In forested areas, fire will also be used (in conjunction with other forest management techniques) to restore structure and composition. In sandy outwash, fire will be used as a disturbance to stimulate vegetation community regeneration and promote blueberry production.
- Use prescribed fire to thwart invasive exotic species such as glossy buckthorn (*Rhamnus frangula*).
- Educate the public regarding the role of fire as a natural disturbance mechanism that regulates vegetation composition and structure. Devise education programs at the Visitor Center specific to fire.
- Promote Fire Use in the Wilderness Area and investigate future use of prescribe fire.
- Complete a Minimum Tool Analysis before any actions are taken in the Wilderness Area.

V. FIRE MANAGEMENT STRATEGIES

A. STRATEGIES TO MEET FIRE MANAGEMENT GOALS

1. Develop expertise and techniques for the use of prescribe fire in roadless areas and other sensitive sites outside the Wilderness Area. These techniques should involve Minimum Tools.
2. Apply the expertise and techniques developed above and then incorporate them into the Wilderness Area.
3. Promote a Fire Use program in a safe and cost-effective manner consistent with resources and ecological values.

4. Develop an eastern Upper Peninsula Fire Use Team qualified to national standards that can respond to local needs for expertise in managing fire within roadless and Wilderness areas. Due to a lack of Fire Use Teams experienced with local conditions (as well as problems associated with travel to Seney NWR and availability) a local team will enhance the probability of actually implementing a Fire Use Plan when conditions are appropriate.
5. Enhance cooperation and coordination between all local wildfire management agencies by conducting prescribed burns utilizing personnel from the Refuge, the Michigan Department of Natural Resources, the U. S. Forest Service, and the U. S. National Park Service both on and off the Refuge.
6. When and where used, suppression strategies and tactics will be unique to each incident dependent on safety considerations, weather conditions, cost of suppression, fuel conditions, availability of resources and location of the fire in relation to structures and cultural resource sites.
7. Minimum Impact Suppression Techniques (MIST) and Minimum Tool Analysis will be used whenever possible outside of the Wilderness Area and always within the Wilderness Area.
8. Prescribed fire will be utilized to replace the effects of wildfire in shaping the structure and composition of vegetative communities for wildlife habitat, control of invasive, exotic, or noxious weed control, and hazard fuel reduction.
9. Create and maintain firebreaks so as to minimize the adverse affects of fire upon property and lands not owned or managed by the Refuge (see **Appendix N**).
10. Strive to emulate the effects of naturally occurring wildfire in the application of prescribe fire by varying the intensity, duration, timing, environmental conditions, and spatial aspects of burns.
11. Increase the vegetation structure complexity by producing snags of varying size across the landscape.

B. FIRE USE STRATEGIES

- Provide increased wildfire protection by constructing fuel breaks around all exterior boundaries and increasing patrols during periods of high fire danger.
- Establish long-term monitoring transects / plots in all major upland habitat types to detect change in vegetation structure and composition between pre and post-burn conditions.
- Prescribed fire may be used to restore and maintain wildlife habitat and to reduce hazardous fuel accumulations, provided resource objectives are also achieved.
- Determine the effects different retardants and foams have on wetland patterns and processes.
- Install and monitor a network of groundwater monitoring wells throughout the Refuge. Evaluate groundwater levels in terms of the impact they have on ground fires during fire events.

C. LIMITS TO STRATEGIES

Because wetlands and watercourses are so intermingled on the Refuge, retardants and foams will only be used on upland areas 300' or more from any waterbody (including wetlands) or when life and property are in immediate danger. Environmental guidelines for foam or retardant use, taken from a paper published by the Forest Service's Missoula Technology and Development Center, are found in **Appendix M**.

VI. FIRE MANAGEMENT RESPONSIBILITIES

A. PERSONNEL

An increased interest in a Fire Management Program at the Refuge warrants more qualified staff (**Appendix C**).

B. REFUGE STAFF RESPONSIBILITIES

Below is a list of positions associated with Refuge burn programs. Some positions are not necessarily associated specifically with Seney NWR, but are included to provide an overview of Service fire management program.

1. Refuge Manager (RM)

The Refuge Manager is responsible for the full range of management duties within the Refuge, including fire management activities that implement an effective fire management program. The appropriate action will be taken by the manager for fires on Refuge lands. Related fire management activities include delegation of authority, approval of agency advisors, implementing the Wildfire Situation Analysis (WFSA) and approval of prescribed fire operations.

2. Fire Management Officer (FMO) or Prescribed Fire Specialist (PFS)

The Refuge Fire Management Officer or Prescribed Fire Specialist, with assistance from other specialists, represents the Refuge and coordinates fire related activities with other refuges, the regional fire management coordinator (RFMC), State and other federal fire organizations and local cooperators. Training and qualification records are maintained for Refuge personnel by this individual who also coordinates Refuge fire training, maintains fire records and systems, and with the Zone FMO coordinates mobilization of resources for off-Refuge assignments. Other duties include preparation of an annual report detailing fire occurrences and preparedness activities undertaken in each calendar year. This report serves as a post-season fire management activity review. The PFS also reviews Refuge annual Prescribed Fire Plans; maintains training and qualification records for Refuge personnel; coordinates Refuge fire training; maintains fire records and systems; assists in developing and implementing fuel management and prescribed fire projects; and coordinates mobilization of Refuge resources for off-Refuge assignments.

3. Zone Fire Management Officer (Zone FMO)

The Zone FMO is a resource shared by the stations within his/her zone. The FMO advises the Refuge Manager or staff as requested on matters relative to fire planning, fire pre-suppression, suppression and prescribed burning. The FMO also assists in intra-agency and interagency fire management needs. The FMO supplies technical assistance relative to fire management activities and also advises the assigned stations on priorities, strategies and tactics to reduce adverse fire impacts. The FMO can assist with oversight and coordination of the Refuge's fire management program, including wildfires, prescribed burning, and fire related dispatch and mobilization. The FMO can also assist with matters pertaining to preparation and implementation of the Fire Management Plan and can represent the assigned stations and coordinate fire related activities with: other refuges, regional fire coordinator, and local, state and other federal fire organizations as directed by the RM.

4. Regional Fire Management Coordinator (RFMC)

Provides coordination, training planning, evaluation and technical guidance, as requested, to the Refuge. Reviews and approves refuge annual Prescribed Fire Plan and budget requests. The RFMC will be informed of all wildfire suppression activity occurring on the refuge. As conditions warrant, approves Refuge step-up plan implementation, and may request fire personnel from the Refuge to meet suppression needs elsewhere. The

RFMC may be called upon to gather additional resources to implement the fire management program.

5. Administrative Officer (AO)

The AO is responsible for posting of firefighter time and meeting procurement needs at the local level during an ongoing incident; serves as communications link for ongoing wildfires and prescribed fires; and is responsible for the administrative support needed to assist the FMO with budget, time and procurement. The AO also serves as a support dispatcher regionally and nationally as qualified.

6. Remainder of Refuge Staff

All staff members assist with fire planning, preparation, operations, and monitoring as qualified, or support rolls as determined by Refuge Manager. Staff members also assist as national wildfire resources as qualified and available.

C. FIRE COOPERATORS AND INTERAGENCY COORDINATION

Hiawatha National Forest, Pictured Rocks National Lakeshore, and lands managed by the Michigan Department of Natural Resource are within close proximity to Seney NWR. Private lands border the Refuge to the east and south. Seney NWR benefits from an excellent relationship with cooperators in regards to fire management and fire fighting. Agreements for fire fighting exist with Hiawatha National Forest (effective until May 2005) and Pictured Rocks National Lakeshore (effective until April 2003, **Appendix D**). An agreement with the Michigan Department of Natural Resources is in progress. A list of phone numbers of personnel associated with cooperators (Michigan Department of Natural Resources 2001 UP Wildfire Mobilization Plan for Cooperators) is given in **Appendix E**.

VII. NORMAL UNIT STRENGTH

A. ENGINES, TOOLS, AND OTHER EQUIPMENT

To carry out an active and effective fire management program, the Refuge must have access to proper equipment and qualified manpower. Without equipment and expertise, the program is severely limited. For a list of Refuge equipment that can be used in the fire management program and the Normal Unit Strength (NUS) of the Refuge see **Appendix F**. See **Appendix G** for a list of equipment available from cooperators.

The Refuge Automotive Worker, who will report any problems that cannot be immediately corrected to the Assistant Refuge Manager, will work with the Prescribed Fire Specialist to conduct a pre-season inspection of all fire equipment. All mechanized equipment deployed on a fire will be inspected.

B. EQUIPMENT AND SUPPLIES (CACHE ITEMS)

See **Appendix F**.

C. PERSONNEL AND LEVEL OF FIRE QUALIFICATION

The Refuge Staff will fill positions to the fullest extent possible. However, at present the Refuge is understaffed and requires additional qualified personnel from nearby Michigan Department of Natural Resources offices and/or Hiawatha National Forest offices for fire management. The current staffing status of Seney NWR by position is found in **Appendix C**, other Refuge contact numbers are found in **Appendix H**.

VIII. PREPAREDNESS

A. CURRENT STAFF AVAILABLE TO MEET POSITION NEEDS

See **Appendix C** for the Refuge personnel list.

B. PRE-SEASON READINESS ACTIVITIES

1. Training

Service policy sets training, qualification, and fitness requirements for all wildland firefighters and prescribed fire positions. All personnel involved in fire management functions will be provided with the training required to meet Service qualifications standards for the position they are expected to perform. Interagency training opportunities will be utilized whenever possible.

a. Training

The Regional Office will pay for all approved fire training if the following criteria are met:

- Participant completes and submits to the Complex FMO a National Wildfire Coordinating Group Interagency Training Nomination form (NFES 2131), complete with supervisory approval and an estimated cost of training, travel, and *per diem* prior to the commencement of training.
- The Regional Fire Management Coordinator approves the training.
- Upon completion of training, a copy of the Certificate of Completion and a copy of the travel voucher are sent to the Budget Assistant for Refuges and Wildlife in the Regional Office.

b. Annual Refresher

All personnel involved in Fire Management activities are required to participate in annual fire management refresher training to be qualified for fire management activities. Refresher training will concentrate on local needs as well as *Standards for Survival* or *Look Up, Look Down, and Look Around*. The National Wildfire Coordinating Group's (NWCG) course *Standards for Survival* provides appropriate refresher training. Fire shelter deployment and use will also be included as part of the annual refresher training.

2. Fitness

a. Physical Fitness

All personnel involved in fire management activities are required to pass an annual wildland fire work capacity test commensurate with the fitness requirements of the positions to which they will be assigned. Work capacity tests will not be given to anyone who has obvious physical conditions--such as known heart problems--which would put them at risk. All individuals are required to complete a pre-test physical activity readiness questionnaire (PAR-Q) prior to taking a physical fitness test. They must read and sign the PAR-Q health screening questionnaire, an informed consent form. The administrator of the test will determine if a fitness test should be given or refer the employee to the employee's supervisor for a physical examination. If an employee cannot answer "NO" to all the question in the PAR-Q health screening questionnaire the test administrator will recommend consultation with the employee's supervisor and the Regional Staff Office for further determination on the employees ability

to participate in fire activities before the person is administered the physical fitness test.

b. Physical Examinations

The Office of Personnel Management has concluded that agencies have the authority to require physical examinations for positions with specific medical standards or physical requirements. The Service has determined that certain designated fire management positions require physical examinations prior to appointment.

A physical examination is required for all new permanent employees and all seasonal employees assigned to arduous duty as firefighters prior to reporting for duty. A physical examination may be requested for a permanent employee by the supervisor if there is a question about the ability of an employee to safely complete one of the work capacity tests. All new permanent fire funded employees are required to have a physical examination. All permanent employees over 40 years of age who take the pack or field test to qualify for a wildland or prescribed fire position are required to take an annual physical examination before taking the test.

- Physical examination shall use Standard Form 78 (SF-78), Certification of Medical Examination specific for arduous and moderate duty fire management activities and Form 1400-108 Physical Requirements for Firefighter and Smokejumper Positions (Supplement to SF-78).
- All examinations are at Government expense and should be charged against the 9251 sub-activity for preparedness personnel and 9263 for dedicated prescribed fire personnel.
- The physical examination required for refuge law enforcement officers may be substituted for the fire physical examination. Two separate physical examinations are not required.
- Completed physical examination forms requiring a second opinion are to be submitted through Personnel to the Chief, Division of Medical and Health Services, at the Department for certification of an employee's fitness for duty.

Each refuge may designate the examining physician, but must offer the individual an opportunity to submit medical documentation from his or her own personal physician. The Regional Fire Management Coordinator should audit medical examination costs periodically to avoid unnecessary expenditures.

All Service employees that are considered for firefighting duties will meet the Job-Related Work Capacity Tests for Wildland Firefighters. When the Job-Related Work Capacity Tests for Wildland Firefighters is to be given, the Work Capacity Test Record will serve as the record that the employee has met the physical requirements as mentioned above. If the Fire Management Officer or the employee has any question concerning the person's ability to physically perform firefighting duties, the employee should not be qualified for a wildland or prescribed fire position.

Personnel participating in prescribed fire activities on refuges which have gentle terrain and light to moderate fuel loads are required to attain a "Moderate" physical fitness rating as defined in the PMS 310-1. Moderate is the standard fitness level for Service prescribed fire operations. Exceptions to the standard are necessary when a Refuge analysis of prescribed fire operations reveals that terrain, tactics and fuels present require physical fitness standards more

restrictive than a "Moderate" standard for a specific prescribed fire project. Refuge personnel will meet the highest physical fitness category required to safely conduct prescribed fire operations on the Refuge, determined by terrain, tactics and fuels. Prescribed fire fitness standards may differ from wildland fire fitness standards because prescribed fire activities are a management action and the pace of work is normally set by individuals as opposed to an emergency situation in which the pace of work is generally set by the emergency situation.

C. EMERGENCY PREPAREDNESS (PRELIMINARY STEP-UP PLAN)

The following Refuge Step-Up Plan is based upon Fire Danger Rating system used by Michigan Department of Natural Resources (**Table 5**). See **Appendix I** for Seney NWR Dispatch Plan.

When fire danger is "**High**," all fire-qualified personnel will maintain a communication link with their supervisor or their designate. All fire equipment used for project work will be brought in at the end of each day and maintained in a fire ready condition. Prescribed burning will be permitted, although staffing contingencies must be taken into account.

As the fire danger increases to "**Very High**," all fire equipment will be kept in a fire ready condition and positioned appropriately. At this level, emergency preparedness funding may be triggered by expanding work weeks and/or daily tours of duty for wildfire qualified personnel to cover seven days a week and through the daily burning period. Initial attack will be done using a combination of FWS and Michigan DNR resources to fill needed positions. Personnel may be resource ordered to fill initial attack needs based on cooperator availability. If any prescribed burning is being considered, a management decision should take into account whether the National Preparedness level is at Level V and are there any other restrictions in effect.

Finally, when the fire danger reaches "**Extreme**," all "**Very High**" actions will be in effect. Temporary closures may be imposed on areas within the Refuge and/or some activities may not be allowed in conjunction with similar impositions by adjacent land managing agencies. Prescribed fire activities will not be conducted when the National Preparedness is at Levels IV or V without approval of the Regional Fire Management Coordinator.

Table 5 - Step-up Plan for Preparedness Actions

Preparedness Action	Fire Danger Level				
	Low	Mod.	High	Very High	Extreme
Station staffing for fire control not required	X				
At least one assigned person "on call"		X	X	X	X
Maintain cell phone contact w/Refuge Headquarters		X	X	X	X
Fire-ready engine at Refuge Headquarters		X	X	X	X
Carry PPE while on duty, wear nomex and boots				X	X
Tour of duty changed at Manager's discretion				X	X
Monitor Michigan DNR fire frequency				X	X
Detection patrol conditional				X	
Refuge fire ban conditional				X	X

1. Initial Attack

Initial attack is the first suppression work on a fire. All wildland fires that are controlled by suppression forces undergo initial attack. The number and type of resources responding to initial attack varies depending upon fire danger, fuel type, values at risk, and other factors. Generally, initial attack involves relatively few resources, and the fire size is small. Seney's initial attack crew, at a minimum, needs to include the following personnel: 2 firefighters, 1 single Resource Boss (one of the above must be at least Incident Commander Type 5 (ICT5)-qualified).

Staff meeting the “**arduous**” fitness standard should, within reason and after notifying the Refuge office, take immediate action to suppress the fire (**see above**).

2. **Extended Attack**

An Extended Attack is a wildfire that has not been contained/controlled by the Initial Attack Forces and additional firefighting resources are arriving, *en route*, or being ordered by the Initial Attack Incident Commander.

a. Characteristics of an Extended Attack Incident

An Extended Attack Incident is normally characterized by:

- Less than 100 acres in size, although in some areas where the values at risk are low and fuels are primarily 3 inches in diameter or less the fire size could be significantly larger.
- Firefighting resources vary from several single resources to several Task Force/Strike Teams.
- The incident may be divided into divisions, but would not meet the Division Supervisor complexity in regards to span-of-control.
- The incident is expected to be contained/controlled in the first operational period. If not, it may transition into a Type II Incident.
- A written Incident Action Plan would not be needed or prepared.
- Some of the Command and General Staff positions such as Planning, Logistics, Safety, and Liaison may be filled, but the Division/Group Supervisor and Unit Leader level as opposed to Type I or Type II.
- Staging areas may be utilized and in some instances a small base established.

b. Transition from an Initial Attack Incident to an Extended Attack Incident

The Initial Attack Incident Commander (IAIC) is usually the individual who must recognize the need for transition into Extended Attack and is usually one of the following:

- First-in Single Resource Boss or a single resource response; or
- A Designated Single Resource Boss of a Multi-Resource response; or
- A more senior officer dispatched with the initial attack forces.

Early recognition by the Initial Attack IC that the Initial Attack Forces will not control a fire is important. As soon as the IC recognizes that the additional forces are needed or knows additional forces are en route he/she must withdraw from direct fireline suppression and:

- Establish an Incident Command Post (ICP) to receive, brief, and assign incoming forces. In most situations this will be the IAIC's vehicle located at an identified point.
- Sketch a map of the fire and identify resource assignments using an ICS Form 201.
- Document the fire organization.
- Keep track of all resources that are on scene, en route, and ordered.
- Document strategy, tactics, and current actions.

If available, the IC should assign a Status/Check-in Recorder to handle the 201 when:

- The fire is expanding rapidly.
- Numerous resources are arriving or are being ordered.
- Radio traffic is constant.

Keep the designated officer, dispatch, the incoming replacement IC, or other higher level officer informed of:

- Status of fire.
- Progress of the suppression forces.
- Additional resources needed.
- Weather conditions, especially changes.
- Special situations such as values threatened.

As additional forces arrive:

- Divide the fire into areas of responsibility (e.g., right and left flank, Division A and Division B).
- Assign individuals responsibility for these areas. At first these will usually be the most qualified people available, but as multiple single resources arrive consideration should be given to aggregating them into Task Forces with a qualified leader.

As the Incident continues to escalate, there may be need for:

- An Operations Section Chief to directly supervise the suppression efforts.
- A Logistical person to begin assessing logistical needs such as feeding, fuel, special equipment, sleeping, etc.
- A Planning person to establish formal check-in; gather, record, and provide on-site information to firefighting personnel and dispatch; collect on-site weather data, weather reports, and weather forecasts; start an Incident Action Plan; prepare maps, and assist in developing a Wildfire Situation Analysis.
- A Safety Officer.

3. Transition to a Type II Incident

At some point, the fire will be contained/controlled or the decision will be made to transition to a Type II organization. Indications as to when to make this transition are:

- The fire will not be controlled in the first operational period.
- Logistics are getting complicated and you need to establish an Incident Base and possibly camps to feed, sleep, and supply personnel on the fire.
- There is a need to fill most or all of the Command and General Staff and support Unit Leader positions.
- Fire complexity exceeds capability of extended attack organization.

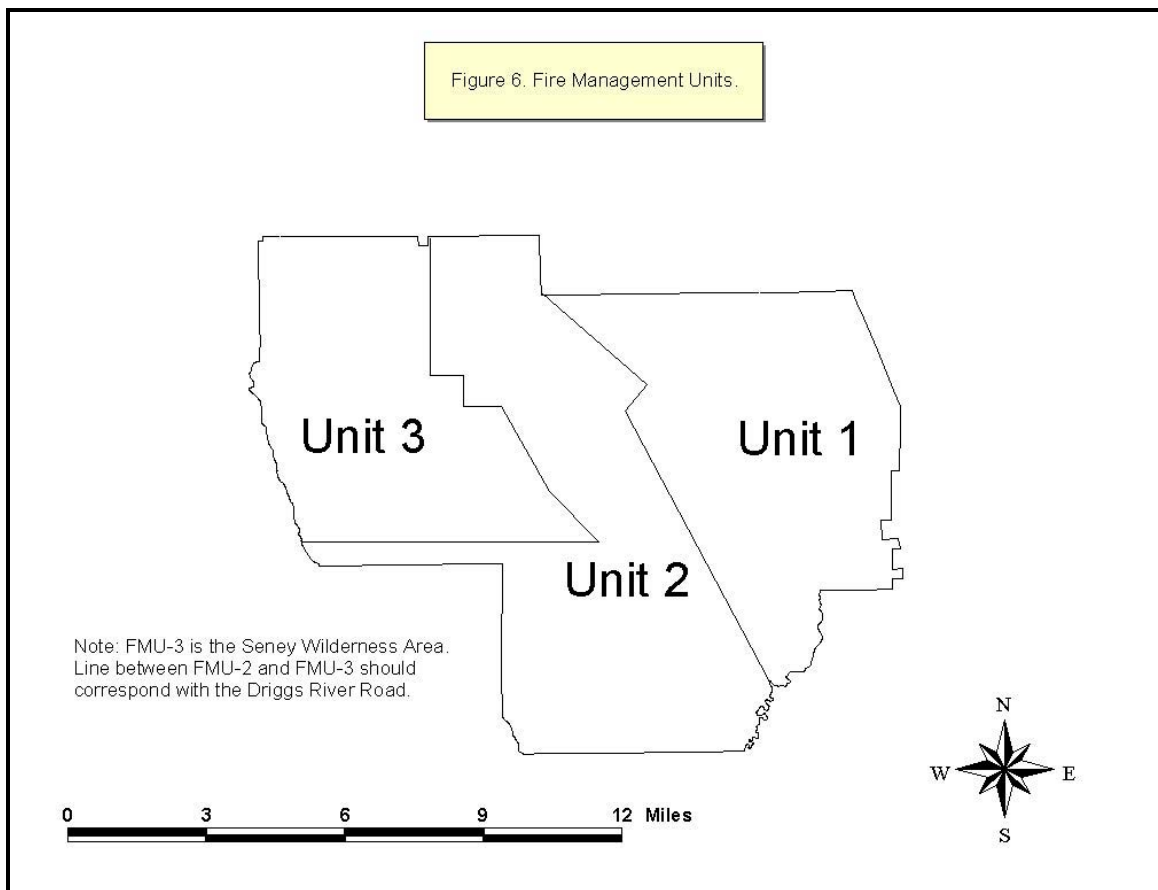
The primary objective of all IC's is to control the fire, but that is not always possible. When it is not, the IC's effectiveness (success) can and will be measured by how smoothly and efficiently the transition of Command can be accomplished due to appropriate suppression action, ordering of needed resources (including support), adequate staffing, good planning, and thorough documentation.

IX. FIRE MANAGEMENT UNITS AND FIRE BEHAVIOR

A. BACKGROUND

At 95,238 acres, Seney NWR is divided into three Fire Management Units (FMUs): FMU 1, 33,657 acres (36% of the Refuge), FMU 2, 36,431 acres (38% of Refuge), and FMU 3, 25,150 acres (26% of Refuge). FMUs were devised based upon existing and potential vegetation features, location to access sites, size and shape, known hazards, as well as management mandates that dictate management strategies to a considerable degree. Other criteria, such as proximity to human development, were deemed not significant enough to further delineate additional FMUs (Fig. 6).

Figure 6 - Fire Management Units



FMU 1 (area east of the Driggs River Road) is considered unique in that it has good access, contains the majority of the Refuge's pools, and contains numerous buildings, including the Refuge Headquarters and Visitor's Center.

FMU 2 (area to the west of the Driggs River Road and east of the Wilderness Area) is unique because is for the most part roadless organic soils wetlands of various vegetation types interspersed with hundreds of sand islands.

FMU 3 (Seney Wilderness Area) is considered a unique Unit because of its designation as a Wilderness Area, problems associated with access, and the special associated habitat type (i.e., string bog).

B. FIRE MANAGEMENT UNIT 1

Fire Management Unit 1 (FMU 1) is approximately 33,657 acres (36% of Refuge). The Unit borders the Driggs River to the west and State Highway 77 to the east. Its northern border includes primarily state-owned lands. To the south, a small number of privately-owned parcels are mixed with state-owned lands. The vast majority of the Refuge pools and buildings are associated with this Unit, as are the historic Conlon and Chicago Farm fields. Much of the Unit is accessible by road. In many ways, this Unit is the most diverse in terms of percentage of land associated with different cover types. The predominant cover types are Coniferous Forest (29%), Scrub-Shrub (22%), and Marsh (19%). The remaining cover types comprise 30% of the Unit (**Fig. 7**). For a discussion of the community types associated with the Unit, see discussion regarding **Shrub swamps, meadows and marshes** and **upland coniferous forest community** in **Section III** above.

Approximately 50% of the Unit is closed to hunting. The existing mosaic of cover types corresponds to a wide variety of fuel types. Fires of moderate to high rates of spread could be expected within much of this Unit, most severe fires would likely occur within areas dominated by coniferous trees on xeric, upland soils. The potential to spread to adjacent lands is moderate. Fire management in this Unit would involve active suppression and prescribed fire.

Habitat management objectives for the Unit include:

- Create a permanent firebreak on the Refuge border with the Town of Germfask (**see Appendix N**). This firebreak will allow for more effective fire management by reducing the likelihood of adverse fire effects.
- Confine wildfires in the FMU through indirect attack and the use of roads and natural features.
- Use prescribed fire to thwart invasive exotic species such as glossy buckthorn (*Rhamnus frangula*).
- Maintain and restore historic vegetation structure, composition, and biodiversity through the use of prescribe fire (see below).

The dominant cover types in this Unit that are associated (to varying degrees) with fire are Coniferous Forest (29%, 9,761 acres), Scrub-Shrub (22%, 7,405 acres), and Marsh (19%, 6,395 acres). For a discussion of the community types associated with the Unit, see discussion regarding **Shrub swamps, meadows and marshes, peatlands, and upland coniferous forest community** in **Section III** above. Total wildfire burnable acres is 29,955. Fire may be used as a management tool on up to 27,599 acres. The only areas excluded from fire treatments are open water (2,019 acres), sumbergent (1,683 acres), and broadleaf forest (2,356 acres).

Assuming a general fire return interval of 20 to 30 years, annual fire treatments for the Unit should average between 920 to 1,380 acres per year. Unit 1 was outside the perimeter of the 1976 Fire with zero acres burned west of the Driggs River. Moreover, there are no records of any significant wildfires in the Unit since Refuge establishment in 1935. Due to suppression of all wildfires for at least the past 68 years and resulting fuel buildup, fire treatments in some vegetation types may need to be initially more frequent and more intense. Differences in precipitation and weather patterns each summer may require adjustments to annual Unit goals. During drier and warmer summers, annual fire goals may be exceeded to compensate for land not burned during wet, cool years. Wetland fires will likely be accomplished during the driest years with upland sites favored during wetter years. On average, over the long term, approximately 1,150 acres should be treated annually.

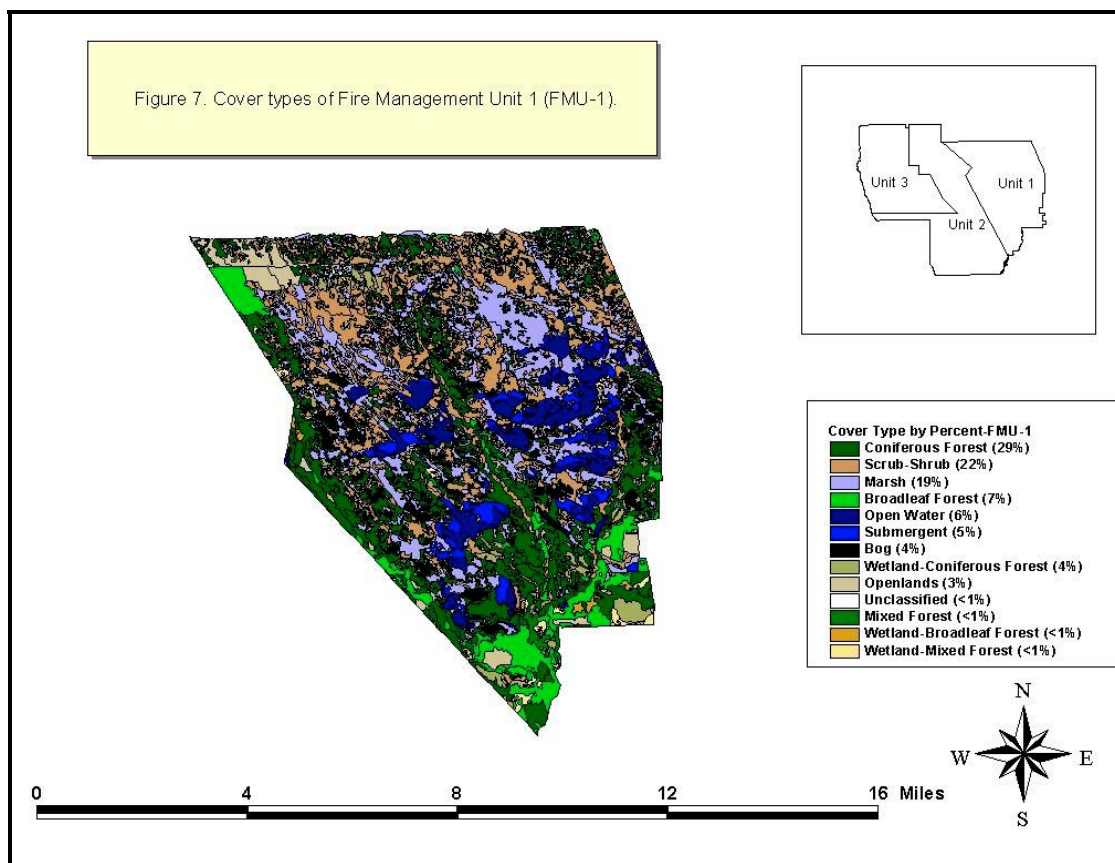
In the Coniferous Forests cover type in this Unit, fire will be used to restore white and red pine communities and produce dense stands of regenerating jack pine. Since forests growing on xeric soils at the Refuge are quite dynamic, management will promote a continuum with respect to composition and structure. Depending on the site and the specific burn objectives, prescribed fire

could be used to kill jack pine seedlings and reduce the jack pine cover in favor of red and white pine. If needed, understory planting of red and white pine could follow the prescribed fire. Prescribed fires along dikes and on scattered islands will be aimed at reducing damage to dikes by tree root systems.

In the Scrub-Shrub and Marsh cover types, fire management will aim to reduce overall woody plant cover (e.g., bog birch, alder, willow) and promote sedges and other herbaceous species. Fire will create and maintain quality early successional habitat by reducing woody vegetation and promoting sedge habitat, thereby promoting breeding habitat for a wide range of wetland obligate species (e.g., waterfowl, yellow rail, sedge wren, Le Conte's sparrow).

The other cover type in which fire for resource benefit will be used is classified as Openland (3%, 1,010 acres). The historic farming areas that comprise this cover type are important spring foraging areas for black bear, sandhill crane, and white-tailed deer. Other species that utilize these areas include savanna sparrow, upland sandpiper, and sharp-tailed grouse. Prescribe fire will be used to maintain these openings, increase connectivity patches, and reduce woody plant encroachment.

Figure 7 - Cover Types of Fire Management Unit 1



C. FIRE MANAGEMENT UNIT 2

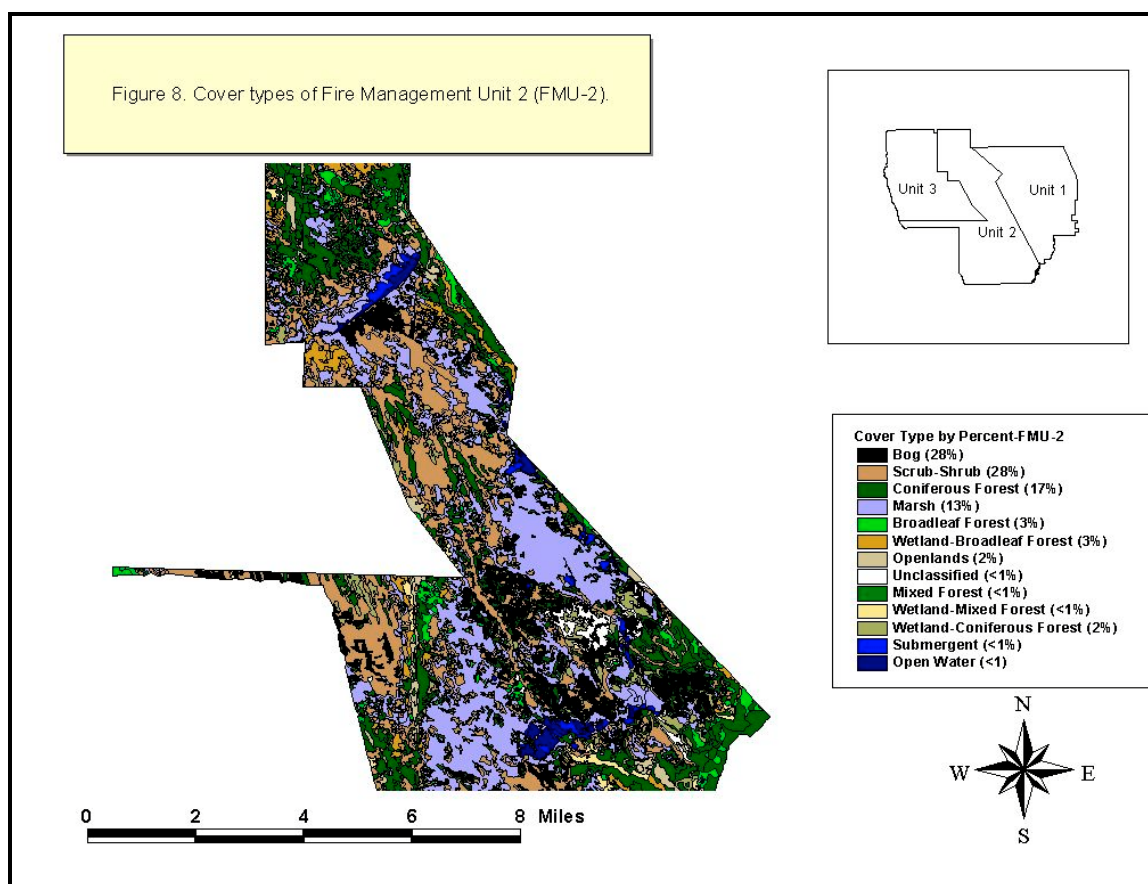
Fire Management Unit 2 (FMU 2) is approximately 36,431 acres (38% of Refuge). The Unit borders FMU 3 to the west, the Driggs River to the east, and the Manistique River to the southeast. Its northern border includes State Highway 28. To the south, some private lands are adjacent to the Unit. Two large pools (C-3 and Marsh Creek Pool) are found in the Unit, as are the historic

Walsh and East Walsh Farm fields. No buildings are associated with the Unit. Although the interior of the Unit lacks roads, access roads do exist on the northern, southern, and eastern flanks. There are also a number of small pools near the eastern edge of the unit along the Riverside Dike.

The dominant cover types in this Unit that are associated (to varying degrees) with fire are Scrub-Shrub (28%, 10,176 acres), Bog (28%, 10,176 acres), Coniferous Forest (17%, 6,178 acres) and Marsh (13%, 4,724 acres). The remaining cover types comprise 14% of the Unit (**Fig. 8**). For a discussion of the community types associated with the Unit, see discussion regarding **Shrub swamps, meadows and marshes, peatlands, and upland coniferous forest community in Section III** above. Total wildfire burnable acres is 36,068. Fire may be used as a management tool on up to 34,978 acres. The only areas excluded from fire treatments are open water (363 acres) and broadleaf forest (1,090 acres). Assuming a general fire return interval of between 20 and 30 years, fire treatments in this Unit should average between 1,166 to 1,749 acres per year (mean annual treatment of 1,458 acres). Differences in precipitation and weather patterns each year may require adjustments to annual Unit goals with some year accomplishments exceeding goals and in other years falling short.

The entire Unit is open to hunting. The existing mosaic of cover types corresponds to a wide variety of fuel types. Fires of moderate to high rates of spread could be expected within much of this unit, most severe fires would likely occur within areas dominated by coniferous trees on xeric, upland soils. The potential to spread to adjacent lands is moderate. Both Fire Use and prescribed fire will be used as management tools.

Figure 8 - Cover Types of Fire Management Unit 2



Habitat management objectives for the Unit include:

- Maintain and restore historic vegetation structure, composition, and biodiversity through the use of prescribe fire and a Fire Use Program.
- Create permanent firebreaks on the north periphery of the Unit (**see Appendix N**). This firebreak will allow for more effective fire management by reducing the likelihood of adverse fire effects.
- Maintain existing roads as firebreaks and access sites.
- Use prescribed fire to thwart invasive exotic species such as glossy buckthorn (*Rhamnus frangula*).

In the Scrub-Shrub, Bog, and Marsh cover types, fire will promote and maintain large areas dominated by sedges and other native herbaceous species and reduce woody plant encroachment. Fire will create and maintain quality early successional habitat by reducing woody vegetation and promoting sedge habitat, thereby promoting breeding habitat for a wide range of wetland obligate species (e.g., waterfowl, yellow rail, sedge wren, Le Conte's sparrow).

In the Coniferous Forest cover type, fire will be used to restore white and red pine communities and regenerate jack pine. Since forests growing on xeric soils at the Refuge are quite dynamic, management will promote a continuum with respect to composition and structure. Depending on the site and the specific burn objectives, prescribed fire could be used to kill jack pine seedlings and reduce the jack pine cover in favor of red and white pine. If needed, understory planting of red and white pine could follow the prescribed fire. In another scenario, stand-replacing fire could be used to create young, dense stands of jack pine. Overall, however, fire will be used to promote the longer-lived red pine and white pine and reduce jack pine coverage, thereby restoring historic stand structure and composition and improved foraging for red crossbills, bohemian waxwings, pine grosbeaks, and other seed-eating winter migrants.

Another cover type in which fire for resource benefit will be used is classified as Openland (2%, 727 acres). The historic farming areas that comprise this cover type are important spring foraging areas for black bear, sandhill crane, and white-tailed deer. Other species that utilize these areas include savanna sparrow, upland sandpiper, and sharp-tailed grouse. Prescribe fire will be used to maintain these openings, increase connectivity patches, and reduce woody plant encroachment. Fire will also be used in some adjacent aspen and paper birch-dominated systems to retain these cover types at different structural stages.

D. FIRE MANAGEMENT UNIT 3

Fire Management Unit 3 (FMU 3) is the westernmost FMU at Seney NWR and is comprised of the Seney Wilderness Area and the associated Strangmoor Bog National Natural Landmark. Total area of this unit is 25,150 acres (roughly 26% of the Refuge). The Strangmoor Bog located within the Wilderness Area contains 9,700 acres. State Highway 28 borders to the north and the Creighton Truck Trail borders the western edge of the Unit. State lands are the primary ownership type adjacent to the Unit. Major cover types are Scrub-Shrub (47%), Bog (12%), Coniferous Forest (11%), and Marsh (9%). All other cover types comprise 21% of the area (**Fig. 9**). No buildings are found in the Unit and, overall, the area is characterized by treeless string bogs and topographically oriented strips of bog forest.

According to a seminal paper by Heinselman (1965) this unit is perhaps the southern limit of patterned bog (patterned fen) in North America and is most closely associated with more northern peatlands developed through processes different from the bog succession found in typical land-filled pitted outwash terrain. Located on the Seney Sand Lake Plain, much of this Unit is covered by a continuous peat blanket several feet in thickness. The peat has the same southeastward slope as the underlying mineral substratum. Higher areas are characterized by bog forest comprised of tamarack and black spruce (see discussion of **peatland community type** in **Section III** above).

An overriding management objective of this Unit is to satisfy the requirements of the Wilderness Act and the Refuge Improvement Act. In brief the definition of wilderness is:

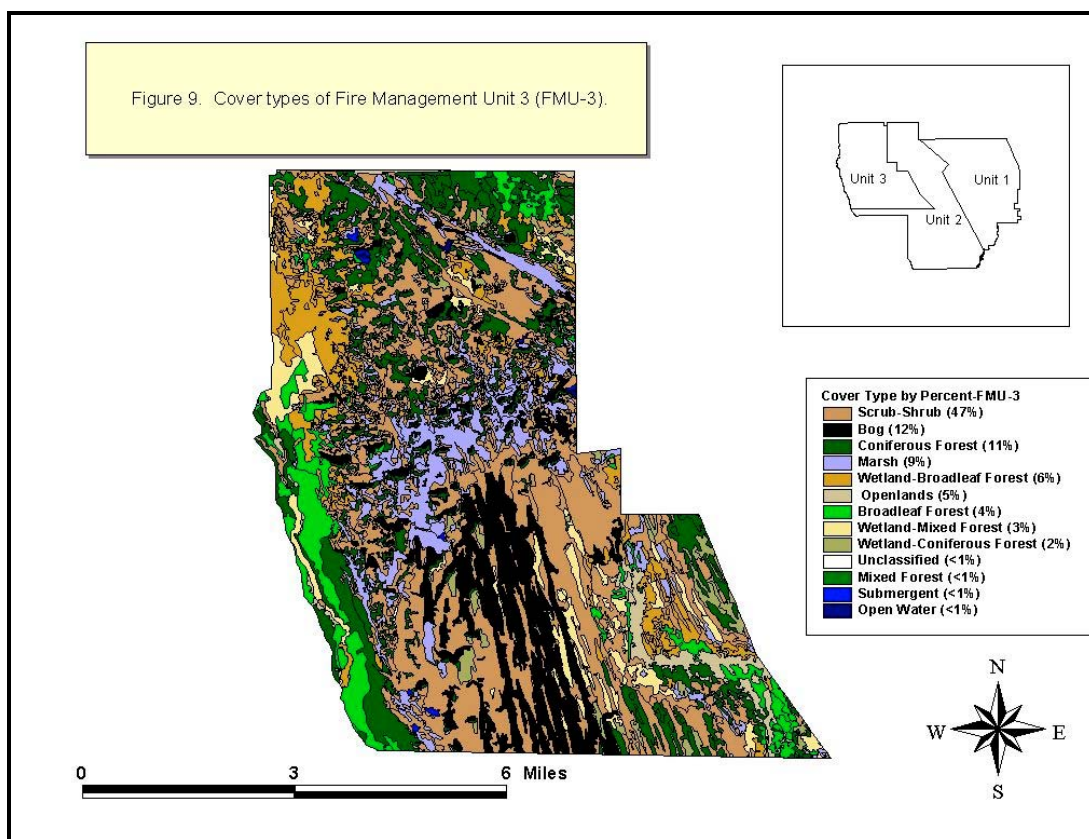
....an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain.an area of undeveloped Federal land retaining its primeval character and influence without permanent improvements or human habitation....

To meet the Wilderness criteria briefly described above, certain uses are prohibited. These can be summarized as:

....except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act....there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area.

The entire Unit is open to hunting in accordance with the Refuge hunting policies, but the interior of the Unit is devoid of roads. Fuel types include islands within coniferous trees, the scrub-shrub cover and the organic soils. Fire Use will be used as management tool. Fire fighting in FMU 3 is likely to prove difficult and a potential for fire to spread to adjacent state lands does exist. In extreme cases where suppression is required, the MIST guidelines found in **Appendix J** will be applied.

Figure 9 - Cover Types of Fire Management Unit 3



Habitat management objectives for the FMU 1 include:

- Create permanent firebreaks on the northwest and north periphery of the Unit (**see Appendix N**). These firebreaks will allow for more effective fire management by reducing the likelihood of adverse fire effects.
- Satisfy the requirement of the Wilderness Act by minimizing the perceived influence of humans. This will be accomplished by promoting a Fire Use Program. In the case in which suppression must be used, management should focus on indirect attacks and MIST.
- Investigate the use of prescribed fire
- Restore and conserve habitat necessary to maintain Refuge and regional-level native biodiversity by promoting a Fire Use Program.

E. FIRE BEHAVIOR

Fire behavior depends upon many variables including relative humidity, air temperature, fuel type, fuel moisture, wind speed, slope, aspect, time of day, and season. On-site predictions of estimated fire behavior can be made with the above inputs and provide outputs of rate of spread, fireline intensity, heat per unit area, and flame length through the use of nomagrams developed for this purpose. Below are listed the major fuel models at Seney NWR. See Anderson (1982) for a more detailed account of these general fuel models. See **Section XI** for a description of fire behavior and prescribed fire.

At Seney NWR, the upland grass type most closely fits model 2.

- *Fuel Model 2 (NFDRS Fuel Models C and T): Fire spread is primarily through the fine herbaceous fuels, either curing or dead. These are surface fires where the herbaceous material, in addition to the litter and dead-down stemwood from the open shrub or timber overstory, contribute to the fire intensity. **Open shrub lands and pine stands** or scrub oak stands that cover 1/3 to 2/3 of the area may generally fit this model; such stands may include clumps of fuels that generate higher intensities and that may produce firebrands.*

At Seney NWR, the marsh and wetland type most closely fits model 3.

- *Fuel Model 3 (NFDRS Fuel Model N): Fires in this fuel are the most intense of the grass group and display high rates of spread under the influence of wind. Wind may drive fire into the upper heights of the grass and across standing water. Stands are tall, averaging about 3 feet, but considerable variation may occur. Approximately 1/3 or more of the stand is considered dead or cured and maintains the fire. **Wild or cultivated grains that have been harvested can be considered similar to tall prairie and marshland grasses.***

At Seney NWR, dense stands of jack pine within the pine forest type most closely fits model 4.

- *Fire Model 4 (NFDRS Fuel Models B and O): Fire intensity and fast-spreading fires involve the foliage and live and dead fine woody material in the crowns of a nearly continuous secondary overstory. Stands of mature shrubs, 6 or more feet tall, such as....the **closed jack pine stands of the north-central States** are typical candidates. Besides flammable foliage, dead woody material in the stands significantly contributes to the fire intensity. Height of stands qualifying for this model depends on local conditions. A deep litter layer may also hamper suppression efforts.*

At Seney NWR, areas with black spruce in the pine forest type (in wetlands) most closely fits model 7.

- *Fuel Model 7 (NFDRS Fuel Models D and Q): Fires burn through the surface and shrub strata with equal ease and can occur at higher dead fuel moisture contents because of the flammability of the live foliage and other live material. Stands of shrubs are generally between 2 and 6 feet high.....**Black spruce-shrub combinations...**may also be represented.*

At Seney NWR, areas comprised of large, mature red and white pines in a closed canopy situation (within the pine forest type) most closely fits model 8.

- *Fuel Model 8 (NFDRS Fuel Models H and R): Slow-burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional "jackpot" or heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humidities, and high winds do the fuels pose fire hazards. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present in the stand. Representative conifer types are **white pine**, and lodgepole pine, **spruce, fir, and larch**.*

At Seney NWR, areas comprised of large, decadent red and white pines in a closed canopy situation (within the pine forest type) closely fits models 9 and 10.

- *Fuel Model 9 (NFDRS Fuel Models E, P, and U): Fires run through the surface litter faster than model 8 and have longer flame height. Both long-needle conifer stands and hardwood stands, especially the oak-hickory types, are typical. Fall fires in hardwoods are predictable, but high winds will actually cause higher rates of spread than predicted because of spotting caused by rolling and blowing leaves. Closed stands of long-needled pine like ponderosa, Jeffrey, and **red pines**, or southern pine plantations are grouped in this model. Concentrations of dead-down woody material will contribute to possible torching out of trees, spotting, and crowning.*
- *Fuel Model 10 (NFDRS Fuel Models G): The fires burn in the surface and ground fuels with greater fire intensity than the other timber litter models. Dead-down fuels include greater quantities of 3-inch or larger limbwood resulting from overmaturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching or individual trees are more frequent in this fuel situation, leading to potential fire control difficulties. **Any forest type** may be considered if heavy down material is present; examples are insect or disease-ridden stands, windthrown stands, overmature situations with deadfall, and aged light thinning or partial-cut slash.*

At Seney NWR, slash most closely fits model 12.

- *Fuel Model 12 (NFDRS Fuel Model J): Rapidly spreading fires with high intensities capable of generating firebrands can occur. When fire starts, it is generally sustained until a fuel break or change in fuels is encountered. The visual impression is dominated by slash and much of it is less than 3 inches in diameter. The fuels total less than 35 tons per acre and seem well distributed. Heavily thinned conifer stands, clearcuts, and medium or heavy partial cuts are represented. The material larger than 3 inches is represented by encountering 11 pieces, 6 inches in diameter, along a 50 feet transect.*

X. FIRE SUPPRESSION

A. BACKGROUND

Where and when appropriate, suppression efforts will be directed towards safeguarding life while protecting Refuge property from harm. Mutual aid resources from Cooperating Agencies will be required to meet suppression goals and objectives. These forces will respond to the Incident Commander (in person or by radio/phone) and if additional forces are needed, appropriate procedures will be used to acquire them.

B. SUPPRESSION STRATEGIES AND TECHNIQUES

1. Utilize existing roads and trails, bodies of water, and areas of sparse or non-continuous fuels as primary control lines, anchor points, escape routes, and safety zones.
2. When appropriate, conduct backfiring operations from existing roads and natural barriers to halt spread of fire.
3. Use burnouts to stabilize and strengthen the primary control lines.
4. Depending on the situation, either direct or indirect attack methods may be employed. The use of backfire in combination with allowing the wildfire to burn to a road or natural firebreak would be least damaging to the environment. However, direct attack by constructing control lines as close to the fire as possible may be the preferred method to establish quicker control.
5. Retardants and foams may be used **only** on upland areas 300' or more from any waterbody (including wetlands of any sort) or in the case when life and property are in immediate danger.
6. Constructed fireline will be rehabilitated prior to departure from the fire or scheduled for rehabilitation by other non-fire personnel.
7. The Incident Commander will choose the appropriate suppression strategy and technique. As a guide:
 - a. on low intensity fires (generally, flame lengths less than 4 feet) the primary suppression strategy will be direct attack with hand crews and dozers;
 - b. if conditions occur that sustain higher intensity fires (those with flame lengths greater than 4 feet) then indirect strategies which utilize back fires or burning out from natural and human-made fire barriers may be utilized. Those barriers should be selected to safely suppress the fire, minimize resource degradation and damage, and be cost effective.
8. Utilize wet lines whenever possible instead of plowed lines to reduce long-term damage to grassland rootmats and to prevent conditions favorable for invasive plant colonization.

C. LIMITS TO SUPPRESSION ACTIVITIES

MIST techniques will be used whenever possible. The use of earth moving equipment (e.g., dozers) for suppression activities on the Refuge will not be permitted without the completion of a Minimum Tool Analysis (see **Appendix P** for examples). All heavy equipment will remain on roads and trails to the fullest extent possible. Retardants and foams will **only** be used on upland area 300' or more from any water body (including wetlands) or when life and property are in imminent danger.

D. RECORDS AND REPORTS

The following old records presently in Refuge files will be maintained as permanent historic fire management records:

- Fire Reports (10-400, DI-1201, and DI-1202);
- Annual Narrative;
- fire weather records;
- historic records of the refuge, including any photographs showing vegetative cover, cover type maps, etc.;
- monthly reports or other files which may represent the only documentation of fire occurrence or fire behavior in the refuge;
- all other maps or records pertinent to fire management.

Situation reports contain current information about fire danger, fire status, and resource availability. Situation reports will be prepared under the following circumstances:

- daily, when in very high or extreme fire danger.
- daily, whenever a fire has occurred, is in progress, or is planned.
- additionally, as required by Regions/zones.

In accordance with local or regional procedures, the Refuge will also provide situation reports to local cooperators or interagency coordination centers.

Historic situation report files will be used in the FIREBASE prescribed fire monitoring needs analysis to monitor staffing requirements. Daily entries for all wildland fires and prescribed burns will therefore be made. The Refuge will also maintain or reference fire weather stations. Weather observations will be entered directly into WIMS.

Each wildland fire and support action will have a fire report prepared and archived to document the fire incident. In the event that a prescribed fire does not meet established objectives, and/or exceeds its established prescription and is reclassified as an unwanted wildland fire, two separate reports will be prepared. The narrative of the prescribed fire report will indicate that the fire was reclassified and reference the new assigned wildland fire number, and report only those acres burned within prescription. A new report will be started for the newly declared wildland fire, and report acres burned from the point of reclassification to the declared out acres. The cause and narrative should indicate that the unwanted wildland fire resulted from a prescribed fire that was reclassified. All unwanted wildland fires caused by prescribed fires will be reviewed.

The Service Fire Management Information System (FMIS) has an on-line data entry and editing application for direct entry of occurrence information. The Refuge will use computer telecommunications capability to file the reports, and retain the hard copy report on file in the Refuge.

XI. PRESCRIBED FIRE PROGRAM

A. BACKGROUND

To meet the goals and objectives of the Fire Management Program (see **Section IV**), prescribed fire can be a useful management tool. In brief, prescribed fire will be used to:

- Reduce wildfire hazards in conjunction with mechanical removal of trees in areas where wildfire potentially threatens local communities (see **Appendix N**).
- Effectively maintain sedge-dominated marshes for yellow rails, Le Conte's sparrows, and other species. Reduce invading woody vegetation comprised of willow, alder and bog birch (Scrub-Shrub cover type) in sedge marshes to favor fire-adapted sedges and grasses.
- Integrate fuel hazard reduction with aspen, paper birch, and jack pine regeneration.
- Maintain xeric openland ecosystems that benefit a variety of species, both openland species that nest on or near the ground (e.g., sandhill crane, sedge wren, LeConte's sparrow) and cavity-nesting species (e.g., American kestrel, black-backed woodpecker, eastern bluebird, northern flying squirrel) that will utilize retained snags.
- Compliment silvicultural prescriptions aimed at pine forest restoration. Prescribed fire will be utilized to restore red and white pine stands in areas where they historically were found.
- Maintain and restore vigor of fruit and berry-producing plants such as raspberries, *Viburnum*, blueberries, dogwoods, juneberries, and cherries.
- Reduce woody plant composition on dikes.
- Thwart invasive species.

B. PROGRAM POLICIES

Before attempting a prescribed fire, adequate firebreaks will surround the burn area. These will be in the form of ditches, dikes, plow lines, block lines, wet lines, roads, streams, or pool margins. Ample water is available on most of the Refuge if the need should arise for large quantities of water. The Refuge has a number of possible control lines that could be used in the event of escape by a prescribed fire, including roads, pools and pool dikes, ditches, and rivers. The Refuge is also interspersed with many marsh areas that under normal conditions would break up any long runs of fire.

When the Refuge is planning to set a prescribed burn, all Cooperators will be notified as to the time of day and exactly where the burn will occur. As an added protection measure to protect the communities of Germfask and Seney from wildfire and potential prescribed fire escapes, a firebreak will be constructed on Refuge boundaries adjacent to both communities pending Service financial support (see **Appendix N**).

C. PROGRAM DESCRIPTION, PROBLEMS, AND SOLUTIONS

For a number of years, the prescribed fire program at Seney NWR has been relatively inactive. The development of this Plan and a Refuge Fire Program will set the groundwork for restoring fire to the Refuge landscape.

Many problems must be faced when fire is used as a management tool. In burning any given area, many different elements must be considered before the burning process begins. Some of the factors that must be evaluated are: weather, fuel, topography, soil moisture, season of the year, crew experience, and smoke management.

1. Weather

The Seney Station of the Michigan Department of Natural Resources maintains fire weather and fire danger rating/index. Under the National Fire Danger Rating System,

which is constantly being upgraded, an accurate and current measurement of buildup index, timber spread index, fine fuel spread index, humidity, fine fuel moisture, temperature, wind speed and direction, and rainfall is kept from April through November. At the same time, the Refuge maintains rainfall, temperature, total wind movement, and evaporation records. The amount and type of information available allows prediction of proper burning conditions and the proper time for ignition.

2. Fuel

Another major factor in fire behavior is the amount and type of fuel to be burned (see **Section IX** for a description of possible fuel models). The area to be burned will be inspected prior to ignition to identify possible problem areas after the burn has begun. Any trouble spots that are identified, such as large piles of slash or large quantities of fine fuels, will then be given special attention during the burn.

3. Topography

Topography is a factor affecting burning from an accessibility standpoint. The topography of the Refuge is generally flat with an interspersed of sandy knolls. In flat areas, saturated soils may limit access of vehicles. One problem that could occur on these knolls would be a hot fire on the southwest facing slopes. Control of the heat generated by fire in these locations would be considered in the prescription for the area.

4. Season

The season in which burns are done influences fire behavior. Spring and fall burns are generally hotter because the herbaceous vegetation is either in the cured or transitional stage. This corresponds to higher buildup, timber spread, and fine fuel indices and a fire that is more difficult to control. Backfire lines must therefore be wider and head fires will be allowed only short runs.

The effects of fire on vegetation depend on climate, site and topography, soil moisture, site condition (including fire frequency), species composition, and timing of fire. Spring burning usually favors warm-season species over cool-season species. The later the fire occurs in spring, but still prior to the emergence of green shoots, the greater the production of warm-season species. However, some vegetation responds negatively to burning in dry areas, or during drought.

Since natural fires are generally associated with lightning strikes at the Refuge, fire regulated vegetation can be considered to have evolved to burn during the growing season (including July-August when lightning strikes are most common). Thus, growing season prescribed fire may more closely emulate natural conditions. Moreover, to control woody plant encroachment, growing season burns are preferred.

5. Smoke Management

Smoke management has become an increasingly important consideration in fire management with the enactment of air pollution legislation and the creation of a Class I Airshed in the Seney area. Research has shown that most of the localized effects occur within two miles of the fire. Planning will be done to minimize the effects of smoke on highways and residential areas. Wind direction will be the most important factor in smoke management on the Refuge. Moreover, it has been determined that many chemical components of burning forest fuels are polycyclic organic compounds that are generally recognized as carcinogens. However, the amount of these compounds produced during prescribed burning is relatively small. Other organic compounds emitted include various aldehydes, hydrocarbons, as well as carbon dioxide and monoxide. In addition to the organic compounds mentioned, some quantities of oxides of nitrogen and sulfur may be produced. However, these compounds are not likely to produce problems.

In most cases, a properly conducted prescribed burn would not result in a significant amount of air pollution. However, at SENEY NWR, organic soils can cause considerable smoke production. Rather than burning completely, as a fuel source organic soils tend to smolder. This issue was dramatically illustrated in the 1976 Fire. More study of ways to manage burns on organic soils is needed. Nonetheless, to keep pollutants to a minimum, burning will be done on days when the combustion will be as complete as possible. Days when the atmosphere is unstable will be used for burning to obtain better smoke dispersion.

The following is a list of techniques useful in minimizing smoke production and impacts (from Prescribed Fire and Fire Effects Working Team 1985):

- do not burn when air stagnation advisories are in effect, during pollution episodes, or when temperature inversions exist;
- burn when conditions are good for rapid dispersion (i.e., the atmosphere should be unstable so smoke will rise and dissipate);
- burn under favorable moisture conditions for the specific fuel type to be encountered;
- use backing fires when applicable;
- burn in small blocks when appropriate;
- mop-up;
- expand the burning season;
- keep soil out of dozer piles and windrows by using rake-type blades.

6. Hydrology

The elevation of groundwater in relation to the ground surface throughout the Refuge is a critical factor in ground fire ignition. A series of groundwater wells will be established and monitored in a variety of locations. During fire events, groundwater levels will be evaluated and correlated with observed ground fire occurrence.

D. PROCEDURES FOR BURNING

Each prescribed fire will have a complete and approved formal Prescribed Fire Plan. The Prescribed Fire Plan will discuss all key issues and concerns identified during Refuge strategic and operational planning. The formal Prescribed Fire Plan will be made up of many operational elements. Each element addresses a specific aspect of the prescribed fire operation. In some cases, special prescription elements, variables, or other requirements unique to the Refuge will require additional entries.

The Service provides a general outline for Prescribed Fire Plans (see: <http://fire.r9.fws.gov/fm/policy/handbook/1-4-2.htm>) and the following are key issues that will be addressed in all Prescribed Fire Plans:

- prescribed burn objectives and how they support the land use objectives for the area;
- expected fire behavior;
- buffer and safety zones;
- fire perimeter length and acreage burned limit.
- analysis of the cumulative effects of weather and drought on fire behavior. This should include a historical analysis of a drought index (i.e., Palmer, Keetch-Bryan, ERC, etc.);
- potential risks to and impacts on visitors, users, and local communities, both on and off site;
- considerations of environmental, economic, and social effects, both on and off site;

- regional and national fire activity are within planned limits;
- the number of fires burning in the planning area at one time is within planned limits.

Items to be checked during the burn day must include:

- predicted weather, environment, and fire behavior are within prescribed limits;
- availability of implementation personnel, contingency forces, equipment, and supplies are within planned limits;
- implementation personnel are briefed;
- required notifications are made.

The following are key Prescribed Fire Plan elements that will be in all Prescribed Fire Plans or other supporting documents:

- Signature page: Provide spaces for signatures of those persons who prepared the plan, the prescribed fire burn boss, the reviewers and the final approval authority.
- Burn unit description: Describe the physical and biological features of the burn unit including the location, topography, fuels, vegetation, slopes, and aspect.
- Vicinity map: Include an overall map showing the position of the project in relation to the surrounding geographical area.
- Project map: Provide a detailed map showing the project boundary, its topographic features, fuel types and/or loadings, potential hazards, areas of special concern, type and size of control line locations and ignition patterns.
- Goals and objectives statements: State the goals and objectives for this specific burn. They must include the prescribed burn objectives that should be measurable treatment objectives (i.e., tons per acre of fuel removed, percentage of plants killed, percentage of mineral soil exposed, etc.) that support the land use objectives.
- Complexity: Identify the degree of difficulty in executing the planned fire.
- Burn organization: List the essential qualified personnel who will be utilized and the positions that they fill. Specify the number of crew personnel that are needed.
- Costs: Estimate the time and costs for the following categories: planning, pre-burn monitoring, preparation for the burn, including line construction; burning; holding; monitoring; mop up; and evaluation. Estimate the costs of equipment used for the burn, including tools, aircraft, supplies, and vehicles.
- Scheduling: State the general time period in which the burn will take place. Show any periods during this time when the burn cannot take place. Provide space to enter the start date, date declared out, and date the DI-1202 is submitted.
- Pre-burn considerations: Preparations on site: Include line to be built, line standards, snags to be felled or protected, equipment to be pre-positioned, special features to be protected, warning signs to be placed, weather recording and monitoring needs, etc.
- Preparations off site: Include equipment readiness, supplies to be purchased, signs to be made, personal protective equipment to be issued, etc.
- Fire prescription: Describe in detail the acceptable ranges of fire behavior and parameters of weather and fuel moisture content or other site variables that are used to define the prescription, acceptable smoke duration and patterns of dispersal, seasons when the burns can be done, and other specific parameters. The use of fire behavior and smoke management prediction aids (e.g., BEHAVE, RXWINDOW, nomograms, SASEM, is recommended).
- Firing/holding plan: Describe in detail the methods and procedures to be used during the firing and how the lines are to be held. This should include the number and types of personnel, equipment, and assignments. Include day, night, and weekend shifts. What are acceptable holding actions on this fire? What constitutes an escape? (refer to "Holding Actions", section in this chapter).
- Contingency plan: Define what contingency actions constitute a significant departure from what was planned or expected and where conversion to a wildland fire is

appropriate. Include procedures to be followed and actions to be taken if the fire exceeds the abilities of the holding crew to keep it within prescribed parameters and/or unit boundaries. Fuels both inside and outside (near and distant) the burn unit should be considered. Who is to declare the fire a wildland fire? Who is to be the incident commander after escape is declared? Define the number and type of contingency forces to be used as initial action. Who is to be notified of the escape? What role will the holding crew take? Should they remain on the burn or suppress the escape? Account for every person as either reassigned or released from the fire and identify who is to supervise those who are reassigned.

- Weather information: Specify the weather information required during all phases of the project and the procedures for acquiring it. How and when will spot weather and smoke dispersal forecasts be requested? How long after the burn will forecasts be required? How is feedback to the Weather Service to be accomplished?
- Protection of sensitive features: Give instructions for the protection of sensitive features within and adjacent to the burn. These include cultural resources, streams, threatened and endangered species, sensitive soils, buildings and improvements, etc. Obtain necessary archaeological and other types of clearances before the area is disturbed.
- Smoke management and air quality: Identify potential smoke sensitive areas and management strategies for avoidance, emission reductions, and/or dilution to minimize environmental impacts including impacts on human health and welfare. Identify what air quality compliance steps must be taken and what permits are required, who is to obtain them, and when they must do so.
- Pre-burn coordination and public involvement: Establish responsibilities for the notification of other agencies, the public, and local landowners, including the notifications and coordination required in the regional preparedness plan. List and identify public information contacts, including local area personnel and press releases. Identify the official local agency public information specialist.
- Pre-burn notification: Formulate a call-up list of individuals and agencies, when they are to be contacted, how they are to be contacted, and assign responsibilities for making specified contacts. Include addresses, phone numbers, radio call signs, and frequencies.
- Public and personnel safety: Describe safety and emergency procedures. Specify that all personnel who are within the active burn area will have the personal protective equipment required for fire management. Identify safety hazards on the burn, measures taken to reduce those hazards, and EMS personnel on the burn. Specify emergency medical procedures, evacuation routes, and emergency facilities to be used.
- Monitoring: Include all monitoring, measurements, and frequency needed to determine if conditions for the burn are within prescription, both before it is started and while it is burning. Describe the location of all sampling plots and transects. Include the necessary measurements and observations to determine if the burn objectives were met.
- Reports: Provide for the documentation of the burn. Include a cost assessment and all required reports such as the DI-1202. Include a critique of the burn by the prescribed fire burn boss. Methods that worked or didn't work and the effectiveness of the prescription in achieving burn or smoke objectives should be evaluated, along with recommendations for future projects. Attach all observation and forecast forms, worksheets and data collected during the burn operation.
- Rehabilitation: Describe in detail any rehabilitation that is to be accomplished, who is to do it, and when it is to be completed. These may include waterbars, trash removal, flush cutting of stumps, scattering or burning of line construction debris and other appropriate treatments.
- Briefing guide and "Go/No-Go" checklist (**Appendix 0**): A short, concise list of the things to be covered during the crew briefing before the fire is started and at the beginning of each operational period after that. Include a summary of conditions that must be met before the burn can commence and continue. These may include, but not be limited to, the presence of all personnel needed to implement the contingency plan, the presence of all required equipment in specified locations, that the fire behavior and

expected weather meet the prescription, and that the required notifications have been made.

- Persons contacted: Retain a list of persons contacted during the development of the Fire Plan. Include Fish and Wildlife Service personnel, other agency personnel, concessionaires, inholders, special interest groups, refuge neighbors, concerned public, etc. Where appropriate, record the date of contact.

Once it has been determined that the weather, fuel, personnel, and other factors are favorable, the following steps will be taken to carry out the burn (see also **Section VI**).

- The local Michigan Department of Natural Resources Seney Fire Equipment Station and the District Headquarters in Newberry will be contacted and informed when and where the burn will take place.
- The crew (likely consisting of personnel from Cooperators) will study aerial photos and maps of the area.
- The type of fire to be used will be determined: headfire, strip-fire, edge-fire, area ignition, center-fire, or other methods as applicable.
- Duties will be assigned.
- A last minute check of equipment will be made.
- A test fire will be started before burning the entire area to test fire behavior.
- During the burning operation the Fire Boss will have the responsibility of crew assignments.
- After the burn, mop-up operations will be done.
- Periodic checks of the burned area will be made to ensure no flare-ups.
- Before, during, and after the burn, photos will be done to document burn results.

If any of the following conditions exists, the situation will be further analyzed before a burn is started:

- No written plan or map.
- Unusual or unexpected fuels are found.
- Inadequate firelines, equipment or personnel.
- Forecast unavailable or does not agree with prescription.
- Questionable visibility or communications.
- Inadequate notice of plans to burn.
- Backup not planned or not available.
- Test fire behavior not as prescribed.

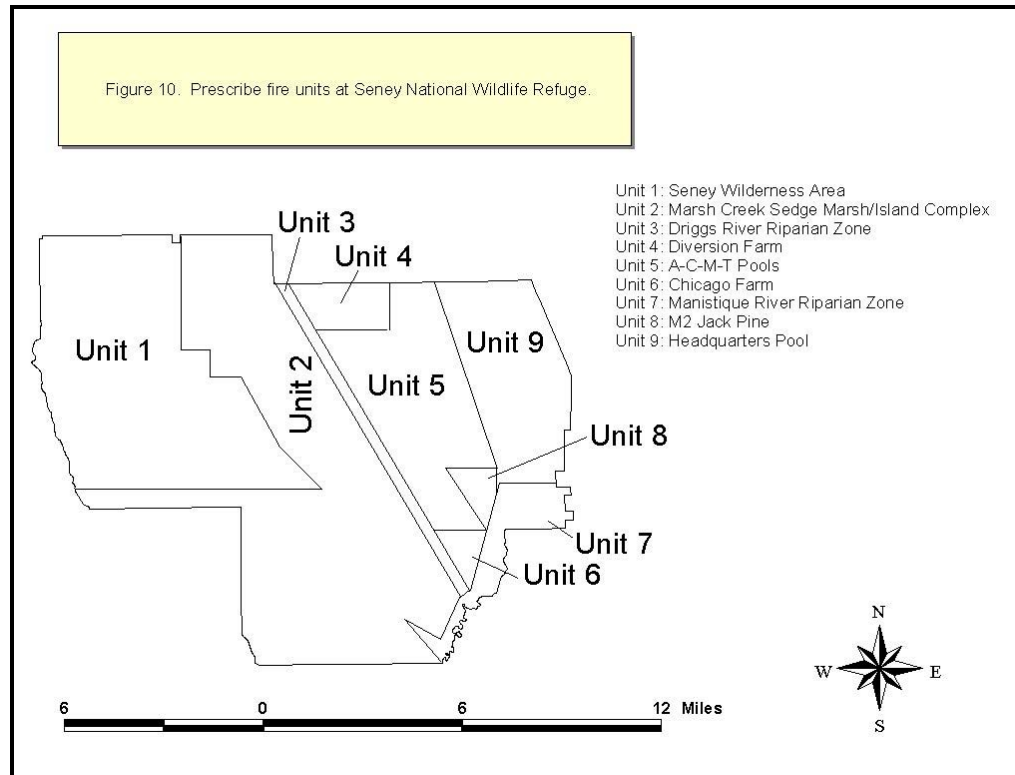
If any of the following exists, burning will be curtailed and any existing fire will be extinguished:

- Fire exhibits erratic behavior.
- Wind or other dangerous weather shift occurs.
- Smoke does not disperse properly.
- Road or other sensitive area smoked in or adequate traffic control problematic or an alternative route not available.

E. PROGRAM UNITS

The Refuge is divided into prescribed fire units according to community type, cover type, or management objective (**Fig. 10**). At present, no prescribed fires are planned for the Wilderness Area (Fire Management Unit 3, Prescribe Fire Unit 1). However, as expertise and information develop, prescribe fire use may be employed. The brief description of the Community Types (associated Cover Types) and Units that follow should be correlated to the discussion of fuel types found in **Section IX**.

Figure 10 - Prescribed Fire Units



**1. Marsh and Open Wetland Community Type
(Including Marsh and Scrub-Shrub Cover Types)**

This type includes the wetter lands of the Refuge. Primary soil types include peats and muck. The vegetation is composed of grasses, sedges, willow, alder, and bog birch. Objectives include: maintain good quality breeding habitat for waterfowl and other wetland obligate wildlife species, maintain dikes, and thwart invasive exotic species. Planned burning rotations at these sites are approximately 3-5 years, depending on the reaction of the vegetation and the groundwater levels. A burning hazard in these types of fires is organic soil fires. Primary Units with this type include 2, 5, and 9.

2. Upland Grass Type (Including Openlands Cover Type)

Here the soils are sands and/or sandy loams. The vegetation is mostly grass with encroaching conifers and hardwoods. The objective is to maintain quality-breeding habitat for grassland obligate species. Planned burning is on a 2-5 year rotation depending on the reaction of the vegetation to the burning. Primary Units with this type include 4, 6, and 7.

**3. Upland Forest Types
(Including Broadleaf Forest, Mixed Forest, and Coniferous Forest Cover Types)**

The soils here are mainly sands and sandy loams with a duff covering. The vegetation consists of jack pine, red pine, white pine, aspen, birch, maple, and hemlock. The objective is to promote a range of vegetation types and age classes from dense young stands of aspen, paper birch, and jack pine to both closed-canopy and open park-like red and white pine stands. Primary Units with this type include 2, 3, 4, 5, and 6.

**4. Wetland Forest Types
(Including Wetland Coniferous Forest, Wetland-Mixed Forest, and Wetland Broadleaf Forest Cover Types)**

The soils here are mainly organic. The vegetation consists of jack pine, spruce-fir, and tamarack. The objective is to maintain the range of types and age classes. Primary Units with this type include 2, 3, 4, 5, and 6.

5. Riparian Types

These areas are directly influenced by streams/rivers. Objective is to maintain a riparian buffer and restore late successional aspects. Unit 3 is the primary area considered.

When burning the above types, peat fires, crown fires, and intense slash fires can occur and lead to spot fires. When burning a marsh with organic soils, care will be taken to prevent peat fires. Where possible and when needed, the water table will be raised to saturate the peat before burning. After the burn is completed, a thorough inspection will be made of the area followed by periodic checks.

When burning under a conifer-dominated canopy, there is a possibility of a crown fire. Burning when the risk of a crown fire is at a minimum can control this problem. Burning when the buildup index and timber spread index is low will help to minimize this problem. Another control against crown fire is to allow the head fires only very short runs.

F. RECORDS

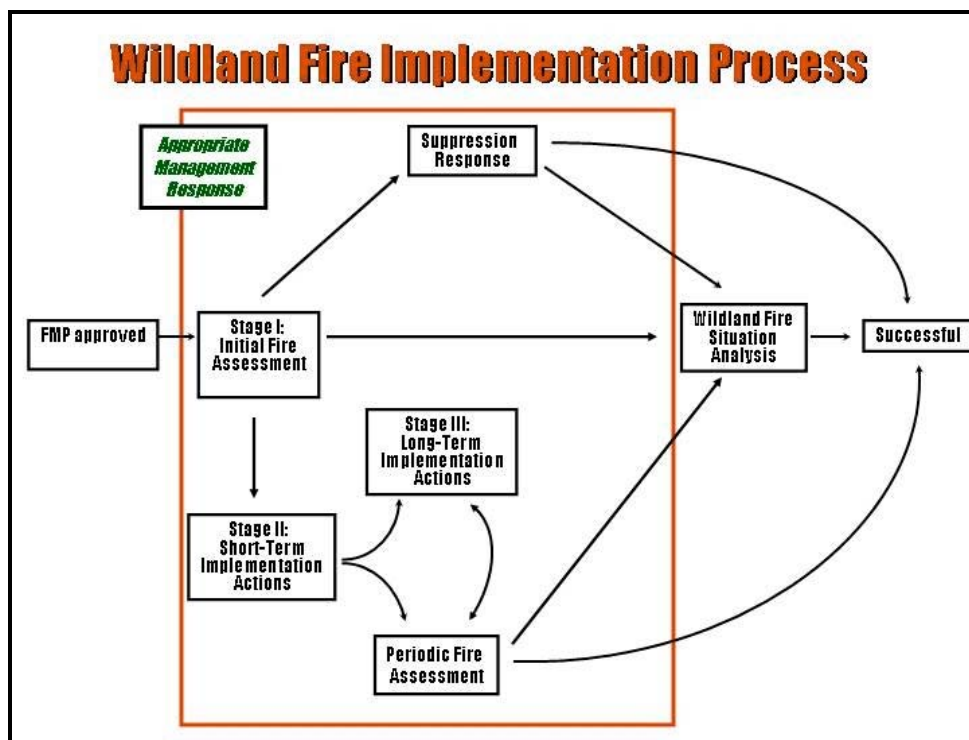
Records and photos of each burn will be maintained. They will be gathered into a central location for ease of accessibility and reference. Photo points will be set in all burn areas that are expected to be treated on a regular rotation basis to keep track of the vegetation response to fire and the effect of additional treatments. Detailed documentation of the fire weather for each burn will be used to build informational guidelines that will be valuable for predicting success and the proper condition for future burns. For more regarding forms and other aspects of fire records, see **Section X**.

XII. WILDLAND FIRE USE PLANNING AND ASSESSMENT

Wildland fires managed for resource benefits have greater planning requirements than wildland fires receiving suppression responses. The flowchart in **Figure 11** provides a view of the necessary steps involved for implementing either Wildland Fire Use or an appropriate management response directed toward suppression.

Managing wildland fires for resource benefits requires significant documentation to chronicle the decision process of the Refuge Manager and fire managers. This documentation process (**Table 6**) has been the cornerstone of successful applications of prescribed natural fire and alternative suppression actions over the past decade. The progressive documentation process described in this section is an updated version of past procedures and will assist the Refuge Manager in implementing the full range of fire management activities available under the 1995 Fire Policy and 2001 Policy Update.

Figure 11 - Wildland Fire Implementation Process



A. WILDLAND FIRE IMPLEMENTATION PLAN PROCESS

A Wildland Fire Implementation Plan (WFIP) will be prepared for all wildland fires occurring in FMUs 2 and 3. Since 1944, approximately 40% of the wildland fires occurring on the Refuge have been located in these FMUs. FMU 1 is designated as a suppression response area and will not have Wildland Fire Use applied. Resource management in FMU 1 will be accomplished using prescribed fire and other accepted management practices.

For an estimated 90+ % of all wildland fires in FMUs 2 and 3, a WFIP Stage I analysis is all that will be required. The remainder will likely require additional planning and documentation while being managed for resource benefit. A complete WFIP consists of three distinct stages (Stage I - III). A WFIP will progressively develop these stages for all wildland fires managed for resource benefits or where initial attack is not the selected response. Conditions of fuel continuity, current fire activity, fire location, predicted weather and fire behavior conditions, and risk assessment results will indicate when various stages must be completed (detailed descriptions of all stages are available in Chapter 3.3 of the Fire Management Handbook).

A standard Wildland Fire Implementation Plan format has been developed. Since the WFIP will be prepared progressively by Stages, specific forms and formats apply to each individual Stage. As each stage is prepared, it will be attached to previous documentation until management of the fire accomplishes the objectives. A software application, WFS Plus99, is available and organizes the information electronically, allowing pre-definition and storage, electronically, of WFU Units and other required WFU information. The charts mentioned in the following discussion are included in the software and automated to simplify WFIP documentation. Printed results meet the paper-based forms requirements. When the complete WFIP has been developed, it is a highly specific operational management plan.

Table 6 - Wildland Fire Use Documentation

Fire Name		
Fire Number		
Documentation Product	Product Needed	Product Completed
WFIP – Stage I: Initial Fire Assessment		
• Fire Situation		
• Initial GO/NO-GO Decision		
WFIP – Stage II: Short-Term Implementation Actions		
• Short-Term Fire Behavior Predictions and Risk Assessment		
• Short-Term Implementation Actions		
• Complexity Analysis		
Stage III Need Assessment Chart		
WFIP – Stage III Long-Term Implementation Actions		
• Long-Term Fire Behavior Predictions		
• Long-Term Risk Assessment		
• Long-Term Implementation Actions		
Periodic Fire Assessment		
• Part 1, Re-validation		
• Part 2, Stage III Need Assessment		
Wildland Fire Situation Analysis		

Table 7 is taken from the Fire Management Handbook and shows critical components of each stage of WFIP completion, requirement status, and completion time frames. The requirement status key is found below the table.

Table 7 - WFIP Process

WFIP Stage	Planning and Assessment Element	Requirement Status			Maximum completion time frame
		Initial Attack	Other Suppression-oriented appropriate management response	Fire use actions	
WFIP Stage I: Initial Fire Assessment	Fire Situation	1	1	1	As soon as possible
	Decision Criteria Checklist (Initial GO/NO-GO Decision)	3	1	1	2 hours after first fire detection
WFIP Stage II: Short-term Implementation Action	Short-term Fire Behavior Predictions and Risk Assessment	3	1	1	24 hours after Stage I completion
	Short-term Implementation Actions	2	1	1	
	Complexity Analysis	3	1	1	
	Stage III Needs Assessment Chart	NA	1	1	

WFIP Stage III: Long-term Implementation Actions	MMA Determination	3	1	1	Within 24 hours after Stage II or Periodic Fire Assessment indicates need
	Fire Behavior Prediction	3	4	4	
	Long-term Risk Assessment	3	4	4	
	Long-term Implementation Actions	3	4	4	
Periodic Fire Assessment	Part I: Re-validation	NA	1	1	On assigned frequency
	Part II: Stage III Need Assessment Chart	NA	1	1	
WFSA		5	5	6	Before implementing new strategy

Requirements Key

1. mandatory
2. mandatory, but can be preplanned
3. optional
4. completed if Stage II or Periodic Fire Assessment, Part 2 indicates need
5. completed if fire exceeds management capabilities
6. completed if Periodic Fire Assessment, Part 1 indicates need

No standards exist for the makeup of teams responsible for preparation of Wildland Fire Implementation Plans or the duration of their assignment. For most complex situations (Stage III), pre-established teams will make the most significant contribution in support of wildland fire use. These teams are a national resource obtained through the established resource ordering process. Due to limited experience with wildland fire use on the refuge, a national team will be requested when Stage III implementation is anticipated.

As Wildland Fire Implementation Plan Stage III is prepared, the information will be attached to previously developed Stage I and II information to complete the Wildland Fire Implementation Plan. Periodic assessments will be conducted at intervals specified in Table 13 to ensure that information supporting Stages I and II is current.

1. WFIP - Stage I: Initial Fire Assessment Purpose

This is the first stage of the Wildland Fire Implementation Plan and establishes documentation used in Stages II and III. It is both an information gathering and decision-making stage. Information gathered provides location, fire cause determination, administrative information, fuel, weather, and fire behavior situation. Documents prepared consist of Fire Situation Report, Initial GO/NO-GO Decision Criteria Checklist, and Recommended Response Action. This information assists the Refuge Manager in making the initial decision to manage fire for resource benefits or to suppress by providing location of fire (FMP suppression or fire use unit), cause of fire (human or natural caused), and validation of fire use decision (GO/NO-GO decision).

The Decision Criteria Checklist (Table 9) provides the Refuge Manager with standard evaluation criteria to determine if the current wildland fire should be managed for

resource benefits. These criteria assess threats from the fire, potential effects of the fire, risk from the fire, effects of other fire activity on management capability, and allow the Refuge Manager to evaluate other, possibly, unforeseen issues.

2. WFIP - Stage II: Short-Term Implementation Actions - Purpose

This stage is primarily to gather additional information for developing implementation actions. Among the items requiring completion are: a risk assessment, short-term implementation actions, complexity analysis, and Stage III Needs Assessment Chart. This stage provides management and staff with information to initiate and/or continue management of wildland fire for resource benefits. It also provides predictions of where the fire may go, how intense it may burn, how fast it may spread, what the necessary short-term management actions are, what the full complexity is, and if long-term management actions (Stage III) need to be addressed immediately.

Stage II is the point at which management of the fire for resource objectives is implemented.

3. WFIP - Stage III: Long-Term Assessment and Implementation Actions - Purpose

Stage III supplements the Fire Management Plan by providing full, long-term, implementation actions necessary to manage a wildland fire to accomplish identified resources management objectives. This stage provides a definition of the ultimate acceptable geographic size of the fire (represented by the Maximum Manageable Area (MMA), considers long-term fire behavior predictions and long-term risk assessment and the likelihood of it reaching the MMA perimeter.

This stage also provides detailed operational activities and documents the planning completed to ensure adequate mitigation actions. Mitigation actions are considered to be those on-the-ground activities that serve to increase the defensibility of the MMA, check, direct, or delay the spread of fire, and minimize threats to life, property, and resources. Mitigation actions may include mechanical and physical non-fire tasks and specific fire tactics to construct firelines, reduce excessive fuel concentrations, reduce vertical fuel continuity, create fuel breaks or barriers around critical or sensitive sites or resources, create "blacklines" through burnouts, and limited suppression actions to limit fire spread and behavior.

B. WILDLAND FIRE USE ACTIONS

1. Stage I: Initial Fire Assessment

a. Fire Situation

Required information for Stage I includes the usual fire size-up information (**Table 8**), staff completion of Decision Criteria Checklist (**Table 9**), and development of a Recommended Response Action.

b. Decision Criteria

The Decision Criteria Checklist (**Table 9**) contains standardized decision criteria to determine if the current wildland fire should be managed for resource benefits. To complete the checklist, the Refuge Manager evaluates the criteria based on input from his/her staff and determines if the appropriate management response is to manage the fire to achieve resource objectives or to initiate suppression actions. A "Yes" response to any of the five elements indicates that management should consider an appropriate management response that is suppression-oriented. All "No" answers to the decision elements indicate that the fire is a viable candidate to be managed for resource benefits. Detailed

explanations of decision elements follow the table.

Table 8 - Fire Situation

Fire Name						
Fire Number						
Jurisdiction(s)						
Administrative Unit(s)						
FMP Unit(s)						
Geographic Area						
Management Code						
Start Date/Time						
Discovery Date/Time						
Current Date/Time						
Current Size						
Location:	Legal Description(s):	T.	R.	Sec.	Sub.	
	Latitude:					
	Longitude:					
	UTM:					
	County:					
	Local Description:					
Cause						
Fuel Model/Conditions:						
Current Weather:						
Predicted Weather:						
Current Fire Behavior:						
Predicted Fire Behavior:						
Availability of Resources:						

Table 9 - Decision Criteria Checklist

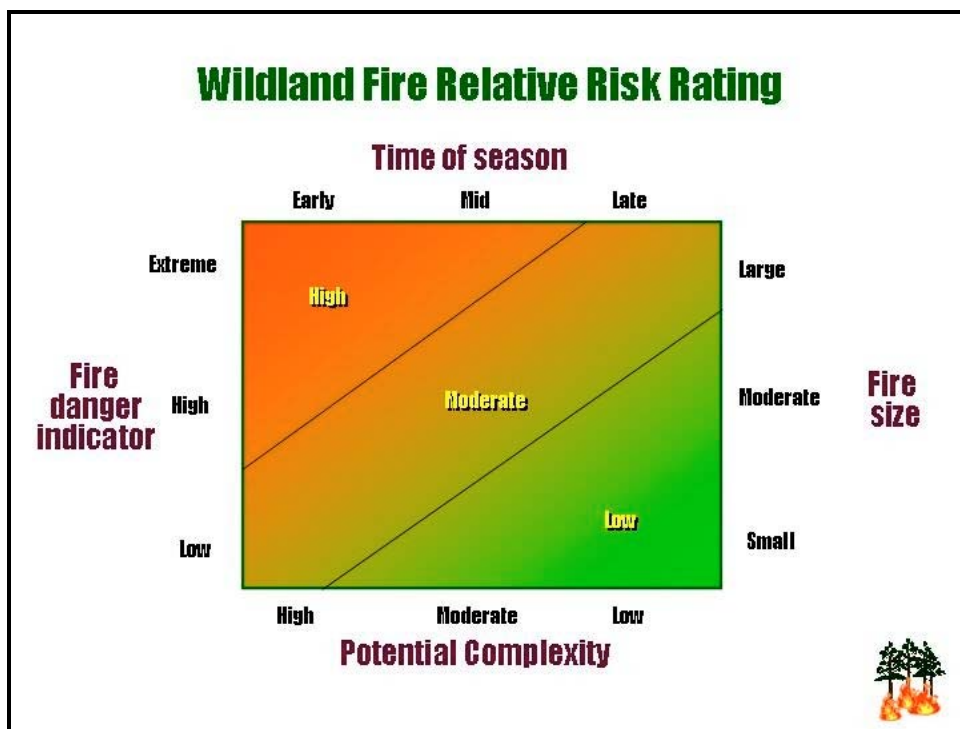
Decision Element		Yes	No
Is there a threat to life, property, or resources that cannot be mitigated?			
Are potential effects on cultural and natural resources outside the range of acceptable effects?			
Are relative risk indicators and/or risk assessment results unacceptable to the appropriate Agency Administrator?			
Is there other proximate fire activity that limits or precludes successful management of this fire?			
Are there other Agency Administrator issues that preclude wildland fire use?			
The Decision Criteria Checklist is a process to assess whether or not the situation warrants continued wildland fire use implementation. A "Yes" response to any element on the checklist indicates that the appropriate management response should be suppression-oriented.			
Recommended Response Action (check appropriate box)	NO-GO (Initial attack/suppression action)		
	GO (Other appropriate management response)		
Signature		Date	

- The first decision element examines identified threats to life, property, and resources. If holding actions cannot mitigate these threats, that indicates the seriousness of the threat. It also indicates that managing the fire for resource benefits has potential flaws, and potentially strong consequences of failure.
- The second decision element relates to objectives for managing fire for resource benefits as stated in the Fire Management Plan. The range of desired effects will generally be closely correlated with fuel conditions and, ultimately, fire behavior.
- The third decision element involves risk assessment for the fire. Since the decision to suppress or manage the fire is time constrained (generally within 2 hours by Service Handbook requirements), it may not be possible to complete a long-term assessment of risk. The Wildland Fire Relative Risk Rating chart has been devised to provide the Refuge Manager with a quick, and fairly comprehensive, assessment of the "relative risk" of the fire. This indicator can be completed in a matter of minutes providing an answer to the third decision element of the checklist.
- The fourth decision element assesses other local and regional fire activity, commitments of unit and cooperator resources, and availability to fill special skill positions from local resources for this fire. If current fire activity precludes the ability to manage fire with adequate resources and skill mixtures, then the response to this element will be "Yes" and a suppression-oriented management response is indicated.
- The final decision element allows the Refuge Manager discretion in the event there are unknown or unforeseen issues that need to be considered in making the decision to manage the fire for resource benefits.

c. Relative Risk Rating

To use the chart in **Figure 12**, assessments of four variables must be made.

Figure 12 - Relative Risk Rating



The appropriate fire danger indicator can be derived from components or indexes from the Canadian Forest Fire Behavior Prediction System (CFFBPS) outputs. **Tables 10 through 13** (below) are to be used to determine the fire behavior rating. The criteria used to develop these tables have been developed over the years to predict fire behavior throughout the Upper Peninsula of Michigan by regional fire behavior experts. High water levels in the Refuge will cause these models to over predict fire potential. Therefore, these models must be used in conjunction with Refuge groundwater level information. Moreover, contact should be made with the Michigan State Fire Duty Officer to discuss the day's fire rating at the onset of an event.

Tables 10 - 13 – Fire Behavior Ratings

The use of SPRING CRITERIA (Table 10) begins with spring snow melt. Using the Fine Fuel Moisture Code (FFMC) and Initial Spread Index (ISI) calculated for the day, find the appropriate Fire Behavior Rating. When the ISI reaches or exceeds 8.0 use Table 11. With Table 11, the Fire Behavior Rating is determined in based on Daily Calculated Fire Weather Index (FWI) and the FFMC.

Table 10 Spring Criteria	ISI = 0.0 to 1.9	ISI = 2.0 to 3.9	ISI = 4.0 to 7.9	ISI = 8.0+
FFMC = 0.0 to 74.9	LOW	MODERATE	HIGH	USE TABLE 11
FFMC = 75.0 to 84.9	MODERATE	MODERATE	HIGH	USE TABLE 11
FFMC = 85.0 5		HIGH	HIGH	USE TABLE 11

Table 11 Spring Criteria	FFMC < 92	FFMC = 92 +
FWI Less Than 30.0	VERY HIGH	VERY HIGH
FWI = 30.0 or Greater	VERY HIGH	EXTREME

The use of SUMMER CRITERIA (Table 12) begins with vegetative green up on or near June 1st. Begin with Table 12 and then use the Build Up Index (BUI) and Initial Spread Index (ISI) to find the Fire Behavior Rating.

Table 12 Summer Criteria	ISI 0.0 to 1.9	ISI 2 to 2.9	ISI 3 to 3.9	ISI 4.0 to 5.9	ISI 6.0 to 7.9	ISI 8.0 to 9.9	ISI 10.0 +
BUI = 0.0 to 44.9	LOW			MODERATE		HIGH	
BUI = 45.0 to 69.9	LOW		MODERATE		HIGH		VERY HIGH
BUI = 70.0 to 99.9	LOW	MODERATE		HIGH		Refer To Table 13	
BUI = 100.0 +	USE SPRING CRITERIA						

Table 13 Summer Criteria	FFMC < 92	FFMC = 92+
FWI Less Than 35.0	VERY HIGH	VERY HIGH
FWI = 35.0	VERY HIGH	EXTREME

The time of season is an indicator of the potential duration of newly ignited fires; the earlier in the season, the longer the potential duration of the fire. Fire size represents the current fire size and is available from the Fire Situation information (**Table 8**). Potential complexity is an estimate of incident complexity. If time and sufficient information are available to complete the full Wildland Fire Complexity Rating Worksheet (**Appendix K**), the result of that analysis can provide this information. If sufficient time and information is not available, then complexity must be estimated by local fire staff and used for this variable.

To obtain the relative risk rating, connect the top and bottom variables with a single line, then connect the left and right variables with a single line. Determine the relative risk of this fire at the intersection of the two lines. Use the relative risk as input information for the Decision Criteria Checklist.

At the bottom of the Decision Criteria Checklist is a check box for the recommended response action (suppression or other appropriate management response) followed by the Refuge Manager's or other delegated individual's signature, and date. This completes Wildland Fire Implementation Plan Stage I.

2. Stage II: Short-Term Implementation Actions

In addition to the information required for Stage I preparation, several other items are needed for Stage II preparation. The result of this process is the development of short-term implementation actions, complete analysis of incident complexity and a decision to hold at Stage II or continue and develop a Stage III analysis.

a. Complexity Analysis

The Complexity Analysis is derived from staff input and review of standard complexity elements found on the Wildland Fire Complexity Rating Worksheet, (**Appendix K**). This is the same worksheet developed and approved by the National Wildfire Coordinating Group (NWCG) and accepted for use by all Federal land management agencies for both Wildland Fire Use and prescribed fire complexity analysis. The Numeric Rating Guide for the worksheet is also found in **Appendix K**. A pre-ignition complexity analysis indicates that any wildland use fire in FMUs 2 and 3 would be, at a minimum, moderately complex.

Using the information in the Numeric Rating Guide, most decision criteria are self-explanatory. Because there is not a lot of recent experience with wildland fire in either FMU 1 or 2, criteria assessments will be rated in the higher category if any one potential effect is found there.

For example, under Air Quality, fires would basically fall under numeric rating 1. In reality, fires would likely produce smoke for more than 4 burning period.

Fire behavior predictions are generated using tables in the Canadian Forest Fire Behavior Prediction System. Inputs include: fuel type, Fine Fuel Moisture Code, Initial Spread Index, Buildup Index, wind speed and direction, slope, aspect, foliar moisture type of prediction (point or line). **See Tables 10 – 13 above.**

b. Risk Assessment

See the section on Relative Risk Rating under Stage I above for a complete explanation.

c. Short-term Implementation Analysis

The Stage II Analysis (**Table 14**) requires the following information:

- Fire Objectives and Desired Effects
- Safety Considerations
- External Concerns
- Environmental Concerns
- Threats
- Short-term Actions
- Estimated Costs of Actions

Many of the entries in this analysis are items that have been considered in the Complexity Analysis. Only the short-term actions and estimated costs are new items.

Short-term actions can vary significantly, depending upon specific circumstances of the particular fire. In cases where the fire may be fuel limited, surrounded by sparse fuels or natural barriers with limited spread potential, monitoring may be specified as the necessary implementation action. In other cases, monitoring plus some form of limited management action may be necessary. In still other cases, the fuel type may require immediate action to delay, check, or direct the spread of fire.

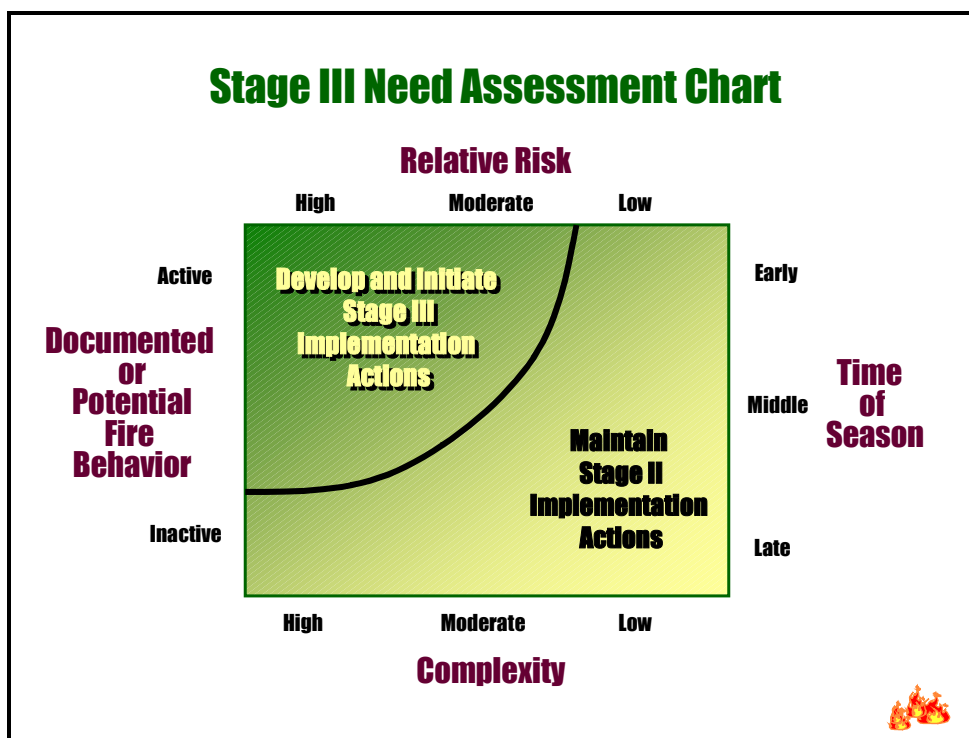
Table 14 - Stage II Analysis

Action Items	Information specific to this fire
Objectives And Desired Effects	
Safety Considerations	
External Concerns	
Environmental Concerns	
Threats	
Short-term implementation actions (including description of action and expected duration)	
Complexity Rating (from the Complexity Analysis Worksheet, Table 3-3-7)	
Estimated Costs	
Title/Date	

d. **Stage III Needs Assessment Chart**

This assessment chart provides the Refuge Manager and staff with an aid to determine if Stage III, Long-Term Assessment and Implementation Actions need to be developed, documented, and implemented immediately, or if the fire can be managed through the established short-term implementation actions until indicated otherwise by the Periodic Fire Assessment. If fuel continuity and spread potential are low or environmental conditions preclude active fire behavior immediate completion of Stage III of the Wildland Fire Implementation Plan may be delayed until specific fire behavior thresholds are reached.

Figure 13 - Stage III Need Assessment Chart



To complete the assessment, local fire staff evaluates time of season and fire behavior. Connect the left and right variables with a line. Relative risk and complexity are drawn from previously completed charts and tables and connected with a line. If the vertical and horizontal lines cross above the curved line on the chart Stage III implementation is needed, otherwise existing Stage II actions are sufficient to manage the fire.

3. Wildland Fire Implementation Plan - Stage III: Long-Term Assessment and Implementation Actions

This stage of the WFIP supplements the Fire Management Plan by providing a set of long-term implementation actions necessary to manage a particular wildland fire to accomplish identified objectives. **Table 7** contains a format with all the needed information included. Because of the special needs in developing the Stage III Assessment, this will normally be accomplished by a Fire Use Team obtained through normal resource ordering channels. Determination of MMA and long-term risk assessment are explained in greater detail in later sections.

Table 15 - Stage III: Long-Term Implementation Actions

Objectives and Risk Assessment Considerations	
Natural and Cultural Resource Objectives and Constraints/Considerations	
Maximum Manageable Are (MMA)	
Acres in MMA (Attach Map of MMA)	
Fire Projections, Weather, and Map	
Projected Fire Area Under Expected Weather Conditions	For Date:
	Area:
Projected Fire Area Under Experienced Severe Weather Conditions	For Date:
	Area:
Weather Season/Drought Discussion and Prognosis	
Long-Term Risk Assessment and Map (if applicable)	
Risk Assessment (describe techniques utilized and outputs, include maps as appropriate)	
Probability of Success	
Describe Probability of Success	
Threats	
Threats to MMA	
Threats to Firefighter Safety and Public Use	
Smoke dispersion and effects	
Other	
Monitoring Actions	
Describe Monitoring Actions, Frequency, and Duration	
Holding Actions	
Describe Holding Actions, Management Action threshold levels that initiate these actions and indicate on map if necessary	
Resource Needs	
Resources Needed to Manage the Fire	
Estimated Costs	
Estimated Costs of Long-Term Implementation Actions	
Contingency Actions	
Describe Contingency Actions, Management Action Thresholds That Initiate Them, and Resources Needed	
Information Plan	
Describe Information Plan Needs and Implementation	

Evaluation and Monitoring	
Describe Post-burn Evaluation Process	
Signatures and Date	

4. Periodic Fire Assessment

This is a step in the implementation process that involves continued assessment to validate decisions regarding management of the fire. It provides a process to evaluate the capability of the local unit to continue to manage the fire for resource benefits, and to determine if the fire is escalating in complexity and operational needs. If the assessment shows inadequate capability to continue to manage the fire, development of a Wildland Fire Situation Analysis (WFSA) is undertaken. If complexity and operational needs are escalating, the decision may be to fully define an MMA, develop long-term fire behavior predictions, conduct long-term risk assessment procedures, or define detailed long-term implementation actions (Wildland Fire Implementation Plan - Stage III).

For each wildland fire use action, the Refuge Manager (or delegated individual) is required to affirm periodically that the capability to continue management of the fire exists. A checklist of information must be completed that accomplishes two purposes. The checklist affirms the unit's capability to continue management of the fire for resource benefits and confirms a decision to develop and document Stage III of the Wildland Fire Implementation Plan.

a. Part 1

The Periodic Fire Assessment, Part 1 (**Table 16**) is the same as the GO/NO-GO Checklist with one additional consideration. Local fire staff reviews and completes the assessment checklist and once initially completed, it is reviewed on the specified assessment frequency (1-3 days, see Table 9). The local unit must note the valid dates and the frequency of assessment. Any decision element changing from "No" to "Yes", indicates an inability to continue management of the fire within defined limits of the current response and triggers preparation of the Wildland Fire Situation Analysis to guide selection of an alternative appropriate management response.

Table 16 - Re-Validation Checklist

Decision Element	Yes	No
Is there a threat to life, property, or resources that cannot be mitigated?		
Are potential effects on cultural and natural resources outside the range of acceptable effects?		
Are relative risk indicators and/or risk assessment results unacceptable to the appropriate Agency Administrator?		
Is there other proximate fire activity that limits or precludes successful management of this fire?		
Are there other Agency Administrator issues that preclude wildland fire use?		
Do expected management needs for this fire exceed known capabilities?		

b. Part 2

The Periodic Fire Assessment, Part 2 of this process revisits the Stage III Needs Assessment Chart. It must be completed periodically for all wildland fires managed for resource benefits where either Stage II or Stage III has been implemented.

Specific elements in Part 2 evaluate the following information:

- Complexity - determined from the Wildland Fire Complexity Rating.
- Fire danger - determined from CFFBPS outputs. Specific fire danger component or index used is determined by the refuge.
- Current point of time in the fire season - this element is extremely important in determining whether Stage III should be completed immediately. The closer the time of season is to its potential maximum, the greater the need to prepare Stage III.
- Short-term fire behavior predictions can be obtained from the CFFBPS.
- Potential type of burning in relation to fire regime and historical fire behavior is obtained from management objectives and correlation with stand and vegetation conditions and historic fire regimes.

The Refuge Manager or designated individual must sign the re-validation signature page on the specified assessment frequency throughout the time period encompassed by the valid dates. The Refuge Manager can delegate, in writing, the revalidation authority that permits the delegated individual to affirm that management capability exists to continue to manage the fire for resource benefit. If or when fire conditions or complexity levels escalate, Periodic Fire Assessment signature authority will automatically and immediately revert to the Refuge Manager.

c. Assessment Frequency

The Periodic Fire Assessment will be conducted at 1 to 3 day intervals. The table below provides breakpoints for assessment frequency. All breakpoints will be compared and the one that calls for the most frequent assessment schedule will be used. Assessments may be completed at more frequent intervals as conditions warrant.

Table 17 - Periodic Fire Assessment Frequency

Frequency (Days)	Daily Percent Increase in Perimeter	Daily Percent Increase in Area	Fire Danger Rating
1	20%+	20%+	Very High
2	> 10% & <20%	> 10% & <20%	High
3	<10%	<10%	< High

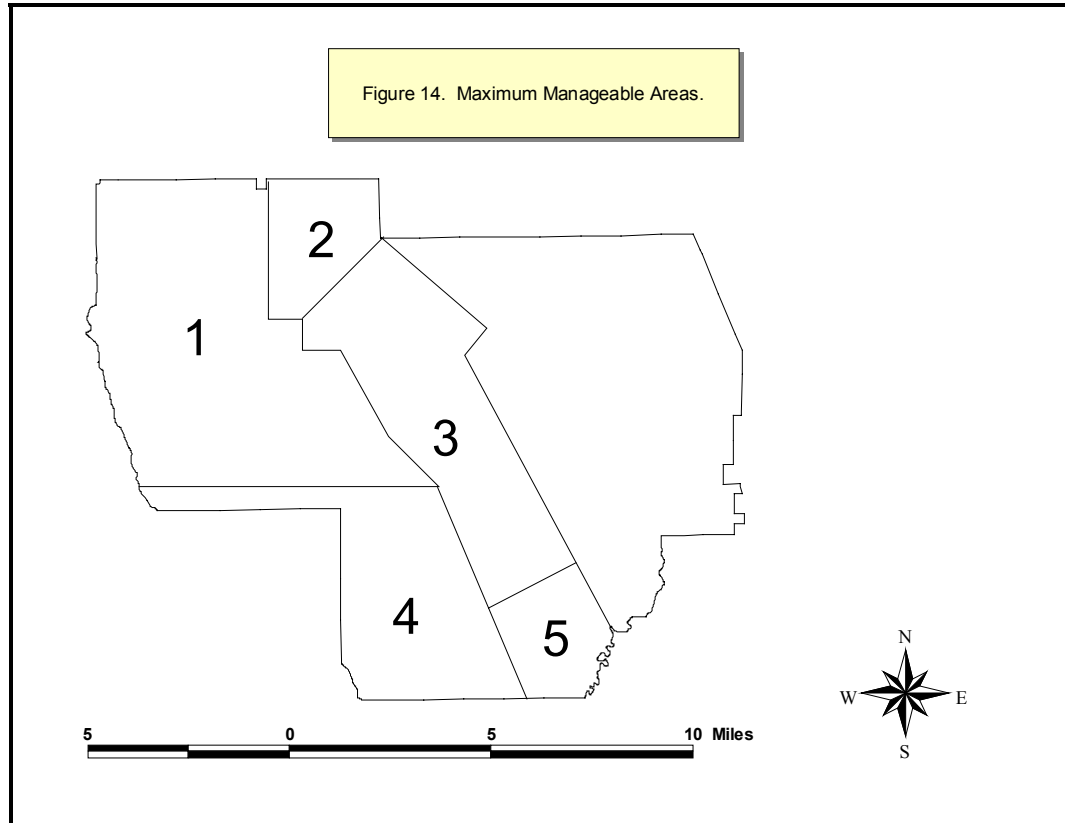
C. MAXIMUM MANAGEABLE AREA DETERMINATION

The Maximum Manageable Area defines the ultimate acceptable size for a given wildland fire managed for resource benefits. It provides for a closely directed fire management application in a specific area defined by resource objectives, fire and weather prescription elements, social needs, political considerations, and management capability.

All Refuge wildland fires being managed under appropriate management response strategies requiring Wildland Fire Implementation Plan Stage I, II, and III will have a defined MMA. This ensures a clear and common understanding of the authorized size and location of the fire among the various Agency Administrators and cooperators.

Pre-planned MMAs are listed below. They are defined primarily using existing natural and man-made features and are for naturally occurring fires within their boundaries (**Fig. 14**).

Figure 14 – Maximum Manageable Areas.



1. Wilderness – Includes the entire Wilderness Area. Firebreaks include: M-28, Creighton Truck Trail, Walsh Ditch, Marsh Creek and the south Wilderness buffer strip.
2. C-3 North – North of C-3 Dike, from west spillway east to Driggs River Road, north to M-28, west to Walsh Ditch, south to C-3.
3. C-3 Southeast – East of Marsh Creek from C-3 Dike to Marsh Creek-Delta Creek Trail to Driggs River Road, north to C-3 access road.
4. Marsh Creek West – Includes the area west of Marsh Creek from the south Wilderness boundary to south refuge boundary east to Marsh Creek and north to Wilderness boundary along Marsh Creek.
5. Marsh Creek East – South of Delta Creek/Riverside Dike trail east of Marsh Creek to south boundary between Marsh Creek Pool and the Driggs and Manistique Rivers.

Adjustments to reduce the MAA size may be made when Stages I and II are developed depending on desired objectives, forecast weather and fire behavior predictions, staffing availability and other management factors. An example would be a fire between the Driggs River and Riverside Dike in C-3 Southeast; the MMA could be reduced to cover the area between the dike and river rather than between the Driggs River Road and Marsh Creek.

All Maximum Manageable Areas will:

- Be based on pre-determined MMAs identified above or may be modified as part of Stage III of the Wildland Fire Implementation Plan.
- Be fixed and not subject to change once established and approved by the Refuge Manager.
- Serve as a definition of firm limits of management capability to accommodate the social, political, and resource impacts for all wildland fire managed for resource benefits.

The complex nature of fires and land management precludes the development of a set of guidelines or directions that cover all potential situations. There may be isolated cases where formal implementation of the Wildland Fire Situation Analysis process because a wildland fire exceeds an established MMA is not prudent or logical. In these cases, experience from past actions applied to expected conditions may indicate that the planned fire size will be exceeded by a very small, non-threatening amount. Management options in this situation include:

- Constraining the fire spread to a small or non-threatening overrun of the original acceptable area using available holding forces and identified in the Wildland Fire Implementation Plan, Stage II and III. Containment of the overrun must be accomplished within two burning periods.
- In the case of relatively long range spotting, an isolated spot generated by this natural process is considered a separate fire and appropriate management action will be based on the normal criteria applied to wildland fires in the FMU.

If the Refuge Manager, Fire Management Officer or Incident Commander determines that the fire cannot continue to be managed safely within its original approved boundary, a Wildland Fire Situation Analysis will be utilized to select a new strategic alternative and appropriate management response.

D. LONG-TERM RISK ASSESSMENT

An array of decision-making support aids is available to support wildland fire complexity and risk assessment. The use of technological tools is appropriate when a tool can provide the decision-maker adequate information to reduce the uncertainty associated with possible outcomes of the decision, to reduce the risk of undesirable outcomes, and to make the best decision possible.

The importance of risk assessment is reinforced by the Guiding Principles from the Fire Policy Review Recommendations that state, "Sound risk management is a foundation for all fire management activities," and "Fire management plans are based on the best available science." Specific assessment products useful in evaluating risk include:

- Probability of the fire reaching the MMA perimeter,
- Probability of a season-ending weather event,
- Indications of where the fire may spread, or total area that may be burned by the fire,
- How fast the fire will travel,
- How soon the fire may reach critical sites or the MMA perimeter,
- Indications of how the fire may burn, predictions of intensity and severity,
- Fuel conditions, moisture conditions, departures from average conditions,
- Fire dynamics - indicators of potential rapid escalation in fire behavior,
- Analysis of fire danger indicators, comparison with 10 years statistics,
- Fire history reviews, records of past fires in terms of area burned and type of fires (i.e., low - moderate intensity, surface fire, stand replacement, etc.),
- Predictions of the range of potential fire effects on natural and cultural resources,
- Probability of adverse smoke events and dispersal.

The Refuge does not currently have the capability of using tools such as Rare Event Risk Assessment Process and Fire Area Simulator. As this capability is developed the risk assessment process will be improved by the availability and use of these tools.

XIII. ADDITIONAL OPERATIONAL ELEMENTS

A. PUBLIC SAFETY

Firefighter and public safety shall take precedence over all other aspects of the Fire Management Program. Under moderate to severe fire danger index ratings, flaming fronts are capable of moving at fast speeds in all fuel models. In order to eliminate safety hazards to the public, all public access into the burn units will be closed the day of the burn. The fire crew will keep the area free of any personnel other than Cooperators and qualified Refuge personnel. Fire crews will be directed to escort any unauthorized personnel found within the unit out of the area.

During wildfires, the Incident Commander is responsible for managing hazards from smoke. Smoke mitigation and management will be included in the Prescribed Fire Plan and is the responsibility of the burn boss. Smoke from a Refuge fire could impair visibility on roads and become a hazard. Actions to manage smoke include: use of road guards and pilot cars, signing, altering ignition techniques and sequences, halting ignition, suppressing the fire, and use of local law enforcement as traffic control.

Wildfires that might escape Refuge lands are also a concern and one that is the responsibility of the Incident Commander.

B. PUBLIC INFORMATION AND EDUCATION

Informing the public is an important part of fire suppression, fire prevention, prescribed fire, and the Service mission. Information and education are critical to gaining public support for the Refuge Fire Management Program. There are several different aspects to this task:

1. Wildfire Suppression

During wildfire suppression, the Incident Commander is responsible for dispersal of information to the press and public or may delegate this responsibility.

2. Prescribed Fire

Informing the public is a vital component of the prescribed fire program. Areas that have been burned will present opportunities for the public to actually see the effects of fires, and offer staff members an opportunity to explain the purpose of the burns to the public. The following will be used to promote prescribed fire to the public:

- Presentation at the Visitors Center,
- Attendance to local fire department meetings as requested,
- Including a prescribed fire message in Refuge interpretive publications and materials,
- Follow prescriptions in Prescribe Fire Plans to avoid escapes,
- News releases and other publications.

C. FIRE CRITIQUE AND PLAN REVIEW

All wildland fires, including prescribed burns and fire-related incidents, will be reviewed. For a detailed discussion see: <http://fire.r9.fws.gov/fm/policy/handbook/3-6.HTM>.

Reviews are conducted for one or more of the following purposes:

- to examine the progress of an on-going fire incident and to confirm effective decisions or correct deficiencies;
- to identify new or improved procedures, techniques or tactics;
- to compile consistent and complete information to improve or refine refuge, regional or national fire management programs;

- to examine anomalous fire-related incidents in order to determine cause(s), contributing factors, and where applicable, recommends corrective actions. If negligence is indicated, the circumstances will be reported and investigated in accordance with applicable regulations, policies or guidelines; and
- to determine the cost effectiveness of a fire operation.

The purpose of fire reviews is to examine all or part of the operations on an individual fire. Generally they occur because of some operational deficiency. Fire reviews should also be conducted on well run and efficient fires in order to document efficient procedures for use on future fires. Fire reviews include the following:

1. "Hotline" Review

The purpose of the hotline review is to examine the progress of an on-going fire incident, regardless of size. The review will provide a confirmation of the decisions being made daily in the Wildland Fire Situation Analysis or determine where the decision process has been faulty and corrective actions are needed. The "hotline" review is normally conducted by the Refuge's Fire Management Officer (or an official who has designated fire program management responsibilities) in conjunction with the Incident Commander on the fire. These reviews require no special reporting. Documentation of "hotline" reviews should be included in the normal fire report narrative.

2. Incident Management Team (IMT) Closeout and Review.

The Refuge Manager will conduct a close-out review with the IMT prior to their release from the fire incident. The purpose of this review is to ensure complete transition of the incident management back to the refuge and to evaluate the status of any incomplete fire business.

3. Prescribed Fire/Wildland Fire Review

All prescribed fires that are reclassified as unplanned and unwanted wildland fires will be reviewed by the Refuge Manager or his or her designated representative. This review may be included as part of a Regional or National Level review if necessary. The purpose of the review is to determine why and under what circumstances a prescribed fire had to be reclassified as a wildland fire. It will identify the circumstances leading to the reclassification of the fire, what actions were taken after reclassification as a wildland fire, and possible future actions that need to be taken to avoid similar situations. A formal report will be prepared, signed by the Refuge Manager, and a copy forwarded to the Regional Fire Management Coordinator and the Fire Management Branch. Costs of the review will be charged to the account assigned to the fire with the approval of the RFMC.

4. Refuge Level Review

The Refuge level review should be convened and conducted by the Refuge Manager or his or her designated representative. The Refuge Manager will appoint other qualified persons, including the refuge Fire Management Officer (or an official who has designated fire program management responsibilities) to be a part of the review. The purpose of this review is to provide the Refuge Manager with information to recognize commendable actions and to take needed corrective action(s). As a minimum an oral review will be conducted. A written evaluation, prepared by the incident commander is required for all extra-period fires. Costs associated with the review will be charged to the account assigned to the fire with the approval of the Regional Fire Management Coordinator. A copy of the complete report will be sent to the Regional Fire Management Coordinator, who will review it and, if appropriate, forward a copy to the Fire Management Branch.

5. Regional Level Review

The regional level review will be convened and conducted by the Regional Fire Management Coordinator or his/her designated representative. A regional level review will generally be conducted for any fire that:

- crosses a refuge's boundary into another jurisdiction without the approval of an interagency agreement;
- results in local adverse media attention;
- involves a fatality, serious injury, or significant property damage;
- or results in controversy involving another agency.

6. Reviews as They Pertain to Prescribed Fires

A Prescribed Fire Plan will be developed each year for each Unit proposed for burning during that season (**see Section XI**). The Plan will be prepared and approved before any burning is initiated and will include a separate package for each burn unit proposed for burning. A detailed list of items to include in each package can be found at <http://fire.r9.fws.gov/fm/policy/handbook/2-1.HTM#2.1.3>

In short, each package will include:

- A detailed prescription including all elements required by the Fire Management Handbook,
- Map displaying the vicinity of the burn in relation to the Refuge and surrounding properties,
- Detailed map of the Unit showing point of test fire, ignition sequence, wind direction, fire breaks, control lines, sources of water, and safety zones,
- A "Go-No Go" checklist,
- A Fire Complexity Analysis (**Appendix K**).
- A Review and Approval signature page.

7. Prescribed Fire Critique and Review

Prescribed fires will be critiqued by the Burn Boss and documented in the DI 1202. The Regional Fire Management Officer will conduct formal critiques in the event of:

- Significant injury, accident, or fatality,
- An escaped prescribed fire occurs,
- Significant safety concerns are raised,
- If a significant smoke management problems occurs.

XIV. AIR QUALITY AND SMOKE MANAGEMENT GUIDELINES

Increasing emphasis on air quality and smoke management affect fire management operations throughout the country. While studies indicate that short-term exposure to wood smoke may not be harmful to healthy individuals it may adversely impact those persons who already have existing respiratory problems such as asthma, emphysema or bronchitis. Extremely high smoke concentrations or long term exposure moderate concentrations may impact even healthy individuals. In addition, smoke affects visibility.

The relatively unpopulated Upper Peninsula has no areas that are in violation of the air quality standards set to protect human health. The Seney Wilderness is designated Class I by the Federal Clean Air Act and, as such, is subject to the Act's National Visibility Goal of preventing any future and remedying any existing visibility impairment due to human-caused pollution in Class I areas. Smoke from fire management activities may temporarily impact air quality and visibility. Research shows that wildfires produce 2-4 times as much particulate matter as prescribed fires because wildfires generally burn during drought periods, consume more total fuel and consume fuels during the less efficient smoldering state (Ottmar et al. 1996). However, by using good smoke management techniques including limiting the acreage and fuel burned and burning during optimum fuel and meteorological conditions it is possible for the Refuge to mitigate impacts to sensitive areas such as roads, local residences, and the Class I area. In the event of unpredicted changes in wind direction or other meteorological changes, the Refuge will employ mitigation measures to assure public health, safety and welfare. Refuge staff will also work with neighboring agencies and State air quality staff to address smoke issues. Each year, potential mitigation measures will be included in the Annual Prescribed Fire Plan for each Unit that is proposed to be burned.

XV. FIRE RESEARCH AND MONITORING NEEDS

Seney NWR could provide a useful model for the long-term effect fire has on vegetation, soil characteristics, and wildlife habitat. Immediately after the 1976 Fire, a study was instigated that investigated this question. Now, 27 years later, a qualitative study comprised of sound hypothesis testing and thorough sampling should be undertaken. Some problems, such as finding and comparing plots, likely exist, but could be overcome by good experimental design. Moreover, this work could dovetail into a broader research program that investigates the effectiveness of fire management in providing habitat for openland bird species (both wetland and upland) of conservation concern.

Research should also be conducted that investigates the natural disturbance regime across all ecotypes. This work would assess the relative importance of fire, wind, and disease as regulating mechanisms.

Monitoring should comply with accepted scientific methods. Fire behavior data will be collected on all prescribed fires occurring on the Refuge. These and other data will be useful in improving the Fire Management Program so as to meet Refuge and Service goals and objectives.

APPENDICES

APPENDIX A: REFERENCES CITED

- Air Quality Briefing, Seney NWR. 2001. Fish and Wildlife Service, Air Quality Branch.
- Albert, D. 1995. Regional landscape ecosystems of Michigan, Minnesota, and Wisconsin: a working map and classification. United States Forest Service, North Central Forest Experiment Station., St. Paul, MN. 250pp.
- Anderson, S. H. 1982. Effects of the 1976 Seney National Wildlife Refuge wildfire on wildlife and wildlife habitat. Fish and Wildlife Service Research Publication, 146, U. S. Department of Interior, Washington, D.C. 28pp.
- Burkman, M. A. 1991. Fire history of Seney National Wildlife Refuge. Unpublished Manuscript.
- Burkman, M. A. 1993. The use of fire to manage breeding habitat for yellow rails. M.S. Thesis, Northern Michigan University, Marquette, MI. 67pp.
- Fire Management Handbook. <http://fire.r9.fws.gov/fm/policy/handbook/default.htm>
- Heinselman, M. L. 1965. String bogs and other patterned organic terrain near Seney, Upper Michigan. Ecology 46:185-188.
- Loope, W. L. 1991. Interrelationships of fire history, land use history, and landscape pattern within Pictured Rocks National Lakeshore, Michigan. Canadian Field-Naturalist 105: 18-28.
- Ottmar, R., Ernesto A., Hessburg, P.,: 1996. Linking Recent Historical and Current Forest Vegetation Patterns to Smoke and Crown Fires in the Interior Columbia River Basin, 523-533pp.
- Niemi, G. J. & J. R. Probst. 1990. Wildlife and fire in the upper midwest. *In*: Sweeney, J.M. (Ed.); Management of dynamic ecosystems. The Wildlife Society, Lafayette, IN.
- Prescribed Fire and Fire Effects Working Team. 1985. Prescribed fire smoke management guide. Boise Interagency Fire Center, BLM Warehouse, Boise, ID.
- Stenzel, J. R. 1982. Ecology of breeding yellow rails at Seney National Wildlife Refuge. M.S. Thesis, The Ohio State University, Columbus, OH. 96 pp.

APPENDIX B: CONSERVATION PRIORITIES FOR REGION 3

Terrestrial vertebrate species listed as Fish and Wildlife Resource Conservation Priorities (FWS Region) that are plausible inhabitants of lands managed by SENEY National Wildlife Refuge and may potentially be affected by fire. Inadequate information on plant species precludes their addition to this list. Species are listed by general habitats used and conservation concern status.

Priority Species	Habitats	Concerns
Gray Wolf	Mixed and Coniferous Forests	Endangered
American Bittern	Wetlands, Beaver Ponds	Rare/Declining
Wood Duck	Wetlands, Beaver Ponds, River Bottomlands	Recreational/Economic Value
American Black Duck	Wetlands, Beaver Ponds	Recreational/Economic Value
Mallard	Wetlands, Beaver Ponds	Recreational/Economic Value
Blue-winged Teal	Wetlands, Beaver Ponds	Recreational/Economic Value
Bald Eagle	Open Water, Pine Nesting Trees	Threatened
Northern Goshawk	Mixed and Coniferous Forest	Rare/Declining
Northern Harrier	Bog, Open Wetlands w/Shrubs	Rare/Declining
Yellow Rail	Bog, Wet Open Sedge Marsh	Rare/Declining
American Woodcock	Mixed Forest, Wetlands	Rare/Declining Recreational/ Economic Value
Sedge Wren	Bog, Wetland w/Shrubs	Rare/Declining
Wood Thrush	Mixed Forests	Rare/Declining
Golden-winged Warbler	Mixed Forests, Shrub Wetlands	Rare/Declining
Cape May Warbler	Coniferous Wetlands w/Sphagnum	Rare/Declining
Connecticut Warbler	Mixed Forest	Rare/Declining
Canada Warbler	Mixed Forest	Rare/Declining
Black-billed Cuckoo	Mixed Forest, Shrub	Rare/Declining
Whip-poor-will	Mixed Forest, Dry Open Understory	Rare/Declining
Northern Flicker	Mixed Forest, Open Understory	Rare/Declining
Olive-sided Flycatcher	Mixed Forest, Open Understory	Rare/Declining
LeConte's Sparrow	Bog, Sedge Marsh, Shrubs	Rare/Declining
Bobolink	Bog, Open Upland Grasslands	Rare/Declining
Rusty Blackbird	Wetland Forests Shrubs	Rare/Declining

APPENDIX C: POSITION NEEDS FOR FIRE MANAGEMENT PROGRAM

One person may fill more than one position. An example of this would be a Prescribed Fire Burn Type II is also qualified as Incident Commander Type 4. The qualifications listed below represent needs and developmental targets for the Refuge staff. These position can also be filled when need by the movement of Service personnel with in the Region 3 or by resource orders.

Position	Number Required	Physical Demands
Incident Commander Type 3 (ICT3)	1	Arduous
Incident Commander Type 4 (ICT4)	2	Arduous
Engine Boss (ENGB)	2	Arduous
Advanced Firefighter, Type 1 (FFT1)	1	Arduous
Dozer Operator/Tractor Plow	2	Arduous
Firefighter Type II (FFT2)	4	Arduous
Fire Use Manager (FUM)	1	Moderate
Prescribed Burn Boss Type 2 (RXB2)	2	Arduous
Ignition Specialist (RXB2)	2	Moderate

Current Refuge Staff

Position	Name	Office Phone	Refuge Cellular Phone
Refuge Manager	Tracy Casselman	906-586-9851 x11	906-235-2337
Assistant Manager	Gary Heet	906-586-9851 x13	906-630-5780
Prescribed Fire Specialist	Gary Lindsay	906-586-9851 x19	-
Biologist	Michael Tansy	906-586-9851 x12	906-630-1596
Forester	Greg Corace	906-586-9851 x14	906-235-2335
Maintenance Mechanic	Lawrence Zellar	906-586-3411	906-630-5788
Maintenance Worker	Terrence Papple	906-586-3411	906-630-5778
Park Ranger	Jennifer McDonough	906-586-9851 x16	-
Park Ranger	Marianne Kronk	906-586-9851 x15	906-630-5779
Administrative Tech.	Laural Tansy	906-586-9851 x17	-

APPENDIX D: COOPERATOR AGREEMENTS

The following are three major items to be addressed in future (and amended) cooperator agreements.

Can we use contracts and cooperative agreements? Local fire departments, qualified contractors, or other cooperators can conduct prescribed fire operations on Refuge lands. Agreements or contracts must clearly state the conditions under which these individuals may conduct prescribed fire operations, liability waivers, qualification and PPE requirements or other items important to the burning operation.

Contractors: Private contractors who specialize in providing fire management services must meet Service standards for qualification and PPE. Contracts should specify these requirements as well as other standards or work accomplishments they are to meet.

Cooperators: Cooperators should meet Service standards for qualification and PPE. It is likely that local cooperators such as Volunteer Fire Departments cannot afford the PPE or the training to meet Service standards. In this case, the Rural Fire Assistance Program may be able to provide some assistance in acquiring PPE and Wildland Fire Training so these cooperators could participate in fire management operations. If an individual cooperator will be supervising Service employees on the burn operation, he/she must be Service qualifications and experience standards.

APPENDIX E: WILDFIRE MOBILIZATION PLAN

APPENDIX F: NORMAL UNIT STRENGTH

Seney National Wildlife Refuge Normal Unit Strength plus equipment available for use in fire management program.

Equipment Item (Number)	Location
All Terrain Vehicle (3)	Refuge Headquarters
Go-Track with 200 gallon tank (1)	Refuge Headquarters
Dozer with plow (1)	Refuge Headquarters
Thiokol Spryte tacked vehicle (1)	Refuge Headquarters
Mark III Pumps (4)	Refuge Headquarters
Heavy Equipment Trailers (2)	Refuge Headquarters
Dump Trucks (3)	Refuge Headquarters
Well Point Kits (16)	Refuge Headquarters
Chainsaw Kits (2)	Refuge Headquarters
Crisifulli 12" Pump (1)	Refuge Headquarters
Excavator (1)	Refuge Headquarters
Backhoe (1)	Refuge Headquarters
Case Loader (1)	Refuge Headquarters
4x4 Type 6 Engine: 1, 300 gallon and 1, 200 gallon (On Order)	Refuge Headquarters
Fire Hose:	
3" --- 400ft	
1-1/2"--- 5,600ft	
1"---1,800ft	Refuge Headquarters
3/4"---1,200ft	
Shelter, Hard Hats, Head Lamps, Goggles, Packs, Line Gear, First Aid Kits, Water Bottles (1 Per Qualified FF2 Individual + 20%)	Refuge Headquarters
Nomex Pants, Nomex Shirts, Gloves (1 Per Qualified FF2 Individual + 20%)	Refuge Headquarters
Shovels, Pulaskis, McLeods, Flaps, Fire Rakes (Minimum of 3 per Vehicle)	Refuge Headquarters
Back Pack Pump (2)	Refuge Headquarters
Portable Pumps (2)	Refuge Headquarters
Wyes, Tees, Wrenches, etc. (1 per Pump)	Refuge Headquarters

APPENDIX G: COOPERATOR EQUIPMENT

Hiawatha National Forest fire equipment and its location as of 2001.

Equipment Item	Location
JD450 Widetrack Tractor Plow	Rapid River (Hiawatha NF)
JD550 Widetrack Tractor Plow	Rapid River (Hiawatha NF)
JD450	Raco (Hiawatha NF)
T6 Engine 300 Gallon w/Foam	Rapid River (Hiawatha NF)
T6 Engine 300 Gallon w/Foam	Raco (Hiawatha NF)
T6 Engine 200 Gallon w/Foam	St. Ignace (Hiawatha NF)
T7 125 Gallon w/Foam	Rapid River (Hiawatha NF)
T7 125 Gallon w/Foam	Rapid River (Hiawatha NF)
T7 125 Gallon w/Foam	Manistique (Hiawatha NF)
T7 125 Gallon w/Foam	Munising (Hiawatha NF)
T7 125 Gallon w/Foam	Raco (Hiawatha NF)

APPENDIX H: REFUGE CONTACT NUMBERS

EMERGENCY NUMBERS

AMBULANCE AND FIRE: Dial 911

Must specify which ambulance you want Schoolcraft- Manistique Hospital or Luce County – Newberry Hospital

IN CASE OF WILDFIRE CALL (HOME NUMBERS, PRIORITY PEOPLE IN BOLD):

Tracy Casselman	906-293-1970
Gary Heet	906-283-3509
Gary Lindsay	906-586-6853
Mike Tansy	906-586-6369
Terry Papple	906-586-9825
Greg Corace	906-586-6818
Lawrence Zellar	906-586-9860
Laurie Tansy(dispatch)	906-586-6369
Marianne Kronk	906-387-5280
Brian McManus (Regional Office)	507-263-8878
Tom Zellmer (Zone FMO)	608-524-1965

Refuge 911 Addresses:

Office:	1674 Refuge Entrance Road
Shop:	1516 Refuge Entrance Road
Visitor Center:	1606 Refuge Entrance Road
Qtrs 1:	1693: Refuge Entrance Road
Qtrs 136:	1636 Refuge Entrance Road
Qtrs 137:	1480 Refuge Entrance Road
Student Cabin:	1504 Refuge Entrance Road
Log Cabin:	9201 Refuge Entrance Road
Riverroad QTRS # 30:	1986 River Road

Manistique Medical Center:	1-800-562-911
Curtis Walk-in Clinic -	906-586-3300 (Monday – Wednesday 8:00 to 3:30 pm)

Medical EMT:	Seney 906-499-3348
	Charlie Hollingshead (First responder only cannot transport)

HOSPITAL:	Newberry:	906-293-5181
	Manistique:	906-341-3200
	Munising:	906-387-4110

STATE POLICE:

One call to any of the three numbers below is answered by Negaunee dispatch. In case of emergency they can contact all three posts.

Newberry:	906-293-5151
Manistique:	906-341-2101
Munising:	906-387-4550

POISON CONTROL: 1-800-562-9781 (U.P. Crisis Line) 420 W. Magnetic, Marquette, MI 49855

Wrecker Service:

Closest is listed first, All are AAA-approved: Don's Automotive-Gulliver 906-283-3857; Eagle Towing – Engadine 906-477-1115; Middletons- Engadine 906-477-6301

APPENDIX I: REFUGE DISPATCH PLAN

Seney National Wildlife Refuge Dispatch Plan

When a report of smoke or fire is received, responding Refuge Staff should obtain as much information as possible. The following list should be addressed:

1. Location of smoke or fire:
2. Location of the individual reporting the smoke or fire:
3. Name and telephone number of the individual:
4. Color of the smoke:
5. Size of the fire (if known):
6. Type of fuel (e.g., trees, grass, shrubs, trash):
7. Character of the fire (e.g., running, creeping, etc.):
8. Anyone treating the fire:
9. Anyone seen in the area or vehicles leaving the area:
10. If "yes" to above, description of vehicle:

After these questions have been addressed:

1. Check map location and ownership/protection status.
2. If the fire is on or threatening the Refuge, dispatch the engine (fire truck) and at least two qualified Staff members. If enough information can be gathered to identify the need for tracked vehicles, they should be dispatched immediately.
3. Notify the station Fire Specialist and/or the Refuge Manager.
4. If initial attack assistance is needed, the MIDNR ICC office in Marquette (906-249-1497) must also be advised so they can take into account that the Seney resources are no longer available for assignment.
5. Maintain a log of all radio and telephone communications. If possible, have someone else take care of incoming phone calls pertaining to the fire.
6. Remain on duty and dispatch further assistance as ordered from the fire.

APPENDIX J: MINIMUM IMPACT SUPPRESSION REQUIREMENTS

Minimum Impact Suppression Tactics - Implementation Guidelines

Minimum impact operations emphasizes the job of managing a wildland fire while maintaining a high standard of care for the land. Actual fire conditions and sound professional judgment will dictate management actions. Consider what is necessary to halt fire spread and ensure it is contained within the fireline or designated perimeter boundary.

Safety

- Safety is of utmost importance
- Constantly review and apply the Situations That Shout Watch Out and Standard Fire Orders.
- Be particularly cautious with:
 - Burning snags that are allowed to burn down.
 - Burning or partially burning live and dead trees.
 - Unburned fuel between personnel and the fire.
 - Identify hazard trees with either an observer, flagging, and/or glow-sticks.
 - Be constantly aware of the surroundings, of expected fire behavior, and possible fire perimeter one or two days hence.

Fire Line Construction Phase.

- Select procedures, tools, and equipment that least impact the environment.
- Give serious consideration to use of water as a tactic (fireline constructed with nozzle pressure, wet lining).
- In light fuels, consider:
 - Cold trail line
 - Allow fire to burn to natural barrier.
 - Consider burn out and use of "gunny" sack or swatter.
 - Constantly re-check cold-trailed fireline.
 - If constructed fireline is necessary, use minimum width and depth to check fire spread.
- In medium/heavy fuels, consider
 - Use of natural barriers and cold-trailing.
 - Cooling with dirt and water, and cold trailing
 - If constructed fireline is necessary, use minimum width and depth to check fire spread
 - Minimize bucking to establish fireline; preferably build line around logs.
- Aerial fuels--brush, trees, and snags:
 - Adjacent to fireline: limb only enough to prevent additional fire spread. Inside fireline: remove or limb only those fuels which if ignited would have potential to spread fire outside the fireline.
 - Brush or small trees that are necessary to cut during fireline construction will be cut flush with the ground.
- Trees, burned trees, and snags
 - MINIMIZE cutting of trees, burned trees, and snags
 - Live trees will not be cut, unless determined they will cause fire spread across the fireline or seriously endanger workers. If tree cutting occurs, cut stumps flush with the ground.
 - Scrape around tree bases near fireline if hot and likely to cause fire spread.
 - Identify hazard trees with an observer, flagging, and/or glow-sticks.
- When using indirect attack:
 - Do not fall snags on the intended unburned side of the constructed fireline, unless they are an obvious safety hazard to crews working in the vicinity
 - On the intended burn-out side of the line, fall only those snags that would reach the fireline should they burn and fall over. Consider alternative means to falling, i.e., fireline explosives, bucket drops.

Mop-up Phase

- Consider using "hot-spot" detection devices along perimeter (aerial or hand-held).
- Light fuels:
 - Cold-trail areas adjacent to unburned fuels.

- Do minimal spading; restrict spading to hot areas near fireline only.
 - Use extensive cold-trailing to detect hot area.
- Medium and heavy fuels:
 - Cold-trail charred logs near fireline; do minimal scraping or tool scarring.
 - Minimize bucking of logs to check for hot spots or extinguish fire: preferably roll the logs.
 - Return logs to original position after checking or ground is cool
 - Refrain from making bone-yards: burned/partially burned fuels that were moved would be arranged in natural position as much as possible.
 - Consider allowing larger logs near the fireline to burnout instead of bucking into manageable lengths.
 - Use lever, etc., to move large logs.
- Aerial fuels--brush, small trees and limbs: remove or limb only those fuels which, if ignited, have potential to spread fire outside the fireline.
- Burning trees and snags:
 - First consideration is allow burning tree/snap to burn themselves out or down (Ensure adequate safety measures are communicated)
 - Identify hazard trees with either an observer, flagging, and/or glow-sticks
 - If burning trees/snap pose serious threat of spreading fire brands, extinguish fire with water or dirt. FELLING by chainsaw will be last means.
 - Consider falling by blasting, if available.

Camp Sites and Personal Conduct

- Use existing campsites if available. There are State Forest and other campsites in the area that should be available.
- Select alternate travel routes between camp and fire if trail wear becomes excessive.

Restoration of Fire Management Activities

- Firelines:
 - After fire spread is secured, fill in deep and wide firelines, and cut trenches.
 - Water bar, as necessary, to prevent erosion, or use wood material to act as sediment dams.
 - Ensure stumps from cut trees/large size brush are cut flush with ground.
 - Camouflage cut stumps, if possible.
 - Any trees or large size brush cut during fireline construction should be scattered to appear natural.
- Camps:
 - Restore campsite to natural conditions as much as possible.
 - Pack out all garbage and un-burnable material
- General:
 - Remove all signs of human activity (plastic flagging, small pieces of aluminum foil, litter).
 - Restore helicopter landing sites.

APPENDIX K: FIRE COMPLEXITY ANALYSIS

The worksheet below contains the pre-ignition complexity rating for a fire in the Wilderness Area (FMU 1). An identical, automated worksheet is also found in the WFIP portion of the WFSA Plus '99 software available in the Refuge Office. The worksheet can be used for prescribed fire complexity analysis as well as for wildland fire use. It can also be used as a tool to provide input to the complexity portion of the WFSA.

Wildland Fire Complexity Rating Worksheet

Complexity Element	Weighting Factor	Complexity Value	Total Points
Safety	5	3	15
Threats to boundaries	5	3	15
Fuels and fire behavior	5	3	15
Objectives	4	3	12
Management organization	4	3	12
Improvements	3	3	9
Natural, cultural, social values	3	1	3
Air quality values	3	5	15
Logistics	3	3	9
Political concerns	2	5	10
Tactical concerns	2	5	10
Interagency cooperation	1	5	5
Total Complexity Points			130
Complexity Rating (circle)	L	M	H

Complexity value breakpoints are shown below and are the accepted interagency standard.

Low	40-90
Moderate	91-140
High	141-200

COMPLEXITY ELEMENT	GUIDE TO NUMERIC RATING		
	1	3	5
Safety	Safety issues are easily identifiable and mitigated	<ul style="list-style-type: none"> Number of significant issues have been identified All safety hazards have been identified on the LCES worksheet and mitigated 	<ul style="list-style-type: none"> SOF1 or SOF2 required Complex safety issues exist

COMPLEXITY ELEMENT	GUIDE TO NUMERIC RATING		
	1	3	5
Threats to Boundaries	<ul style="list-style-type: none"> Low threat to boundaries POI < 50% Boundaries naturally defensible 	<ul style="list-style-type: none"> Moderate threat to boundaries POI > 50 < 70% Moderate risk of slopover or spot fires Boundaries might need mitigation actions for support to strengthen fuel breaks, lines, etc. 	<ul style="list-style-type: none"> High threat to boundaries POI > 70% High risk of slopover or spot fires Mitigation actions necessary to compensate for continuous fuels
Fuels/Fire Behavior	<ul style="list-style-type: none"> Low variability in slope & aspect Weather uniform and predictable Surface fuels (grass, needles) only Grass/shrub, or early seral forest communities Short duration fire No drought indicated 	<ul style="list-style-type: none"> Moderate variability in slope & aspect Weather variable but predictable Ladder fuels and torching Fuel types/loads variable Dense, tall shrub or mid-seral forest communities Moderate duration drought Drought index indicates normal conditions to moderate drought; expected to worsen 	<ul style="list-style-type: none"> High variability in slope & aspect Weather variable and difficult to predict Extreme fire behavior Fuel types/loads highly variable Late seral forest communities or long-return interval fire regimes Altered fire regime, hazardous fuel /stand density conditions Potential long duration fire Drought index indicates severe drought; expected to continue
Objectives	<ul style="list-style-type: none"> Maintenance objectives Prescriptions broad Easily achieved objectives 	<ul style="list-style-type: none"> Restoration objectives Reduction of both live and dead fuels Moderate to substantial changes in two or more strata of vegetation Objectives judged to be moderately hard to achieve Objectives may require moderately intense fire behavior 	<ul style="list-style-type: none"> Restoration objectives in altered fuel situations Precise treatment of fuels and multiple ecological objectives Major change in the structure of 2 or more vegetative strata Conflicts between objectives and constraints Requires a high fire intensity or combination of fire intensities that is difficult to achieve

COMPLEXITY ELEMENT	GUIDE TO NUMERIC RATING		
	1	3	5
Management Organization	<ul style="list-style-type: none"> Span of control held to 3 Single resource incident or project 	<ul style="list-style-type: none"> Span of control held to 4 Multiple resource incident or project Short-term commitment of specialized resources 	<ul style="list-style-type: none"> Span of control greater than 4 Multiple branch, divisions or groups Specialized resources needed to accomplish objectives Organized management team (FUMT, IMT)
Improvements to be Protected	<ul style="list-style-type: none"> No risk to people or property within or adjacent to fire 	<ul style="list-style-type: none"> Several values to be protected Mitigation through planning and/or preparation is adequate May require some commitment of specialized resources 	<ul style="list-style-type: none"> Numerous values and/or high values to be protected Severe damage likely without significant commitment of specialized resources with appropriate skill levels
Natural, Cultural, and Social Values to be Protected	<ul style="list-style-type: none"> No risk to natural, cultural, and/or social resources within or adjacent to the fire 	<ul style="list-style-type: none"> Several values to be protected Mitigation through planning and/or preparation is adequate May require some commitment of specialized resources 	<ul style="list-style-type: none"> Numerous values and/or high values to be protected Severe damage likely without significant commitment of specialized resources with appropriate skill levels
Air Quality Values to be Protected	<ul style="list-style-type: none"> Few smoke sensitive areas near fire Smoke produced for less than 1 burning period Air quality agencies generally require only initial notification and/or permitting No potential for scheduling conflicts with cooperators 	<ul style="list-style-type: none"> Multiple smoke sensitive areas but smoke impact mitigated in plan Smoke produced for 2-4 burning periods Daily burning bans are sometimes enacted during the burn season Infrequent consultation with air quality agencies is needed Low potential for scheduling conflicts with cooperators 	<ul style="list-style-type: none"> Multiple smoke sensitive areas with complex mitigation actions required Health or visibility complaints likely Smoke produced for greater than 4 burning periods Multi-day burning bans are often enacted during the burn season Smoke sensitive Class I airsheds Violation of state and federal health standards possible Frequent consultation with air quality agencies is needed High potential for scheduling conflicts with cooperators

COMPLEXITY ELEMENT	GUIDE TO NUMERIC RATING		
	1	3	5
Logistics	<ul style="list-style-type: none"> • Easy access • Duration of fire support is less than 4 days 	<ul style="list-style-type: none"> • Difficult access • Duration of fire support between 4 and 10 days • Logistical position assigned • Anticipated difficulty in obtaining resources 	<ul style="list-style-type: none"> • No vehicle access • Duration of support is greater than 10 days • Multiple logistical position assigned • Remote camps and support necessary
Political Concerns	<ul style="list-style-type: none"> • No impact on neighbors or visitors • No controversy • No media interest 	<ul style="list-style-type: none"> • Some impact on neighbors or visitors • Some controversy, but mitigated • Press release issued, but no media activity during operations 	<ul style="list-style-type: none"> • High impact on neighbors or visitors • High internal or external interest and concern • Media present during operations
Tactical Operations	<ul style="list-style-type: none"> • No ignition or simple ignition patterns • Single ignition method used • Holding requirements minimal 	<ul style="list-style-type: none"> • Multiple firing methods and/or sequences • Use of specialized ignition methods (i.e. terra-torch, Premo Mark III) • Resource required for up to one week • Holding actions to check, direct, or delay fire spread 	<ul style="list-style-type: none"> • Complex firing patterns highly dependent on local conditions • Simultaneous use of multiple firing methods and/or sequences • Simultaneous ground and aerial ignition • Use of heli-torch • Resources required for over 1 week • Multiple mitigation actions at variable temporal and spatial points identified. Success of actions critical to accomplishment of objectives • Aerial support or mitigation actions desirable/necessary
Interagency Cooperation	<ul style="list-style-type: none"> • Cooperators not involved in operations • No concerns 	<ul style="list-style-type: none"> • Simple joint-jurisdiction fires • Some competition for resources • Some concerns 	<ul style="list-style-type: none"> • Complex multi-jurisdictional fires • High competition for resources • High concerns

APPENDIX L: WILDFIRE SITUATION ANALYSIS

Wildland Fire Situation Analysis

WFSA Information

WFSA Number: 1

Jurisdiction(s): SENEY NWR

Fire Name: Wilderness 1

Geographic Area: Eastern

Incident Number: 3102

Unit: Seney NWR

Date/Time Prepared: 07/11/02 1615

Management Code: 31510-9262-3102

Fire Situation

Start Date/Time: 07/11/02 1345

Current Fire Size: 5.3 acres

Fuel Conditions:

Mixed Pine/Hardwoods FM 8/9 65%/35%

1 hr.=8%

10 hr.=10%

100 hr.= 13%

1000 hr.= 19%

Fire Behavior - Current and Forecast:

Current: ROS 3 chs/hour, Flame length 1-3 feet

Forecast: ROS 11 ch/hour, Flame length 2-4 feet

Size prediction about 40 acres end of first burning period

Weather - Current and Forecast:

Current: Sunny, 73 degrees, Dewpoint 56, Wind SW 5-11 mph

Forecast: High near 80, RH 35-60%, winds steady SW 5-10 mph

Suppression Resource Availability:

3 FFT2, 1 ICT% and one engine on site. State resources not likely to be available as they are working series of fires to west of refuge.

WFSA No.1

Wilderness 1

Page 2

Objectives

Objective	Priority	Weight	Contribution
Safety	10	0.36	
Firefighter Safety	10	0.59	0.210
Ensure safety of firefighters near marsh areas along Creighton River.			
Public Safety	7	0.41	0.147
Place staff near road to answer questions and prevent public from going to fire.			
Economic	5	0.18	
Water	5	0.23	0.041
Protect water quality			
Wilderness	10	0.45	0.081
No foam/retardant close to water sources. No motorized equipment to be used, MIST to be preferred operational method.			
Wildlife	7	0.32	0.057
Environmental	8	0.29	
Air	10	0.59	0.168
Minimize adverse effects on Class I airshed. Be aware of smoke impacts toward highway to north of fire.			
T & E Species	7	0.41	0.118
Social	5	0.18	
Employment	0	0.33	0.060
Public Concern	0	0.33	0.060
Cultural	0	0.33	0.060

WFSA No.1

Wilderness 1

Page 3

Alternatives

Alternative A Minimize Fire Size

Aggressive suppression to contain in one burning period

Target Outcome
Keep within 10 acre size limit

Worst Case Outcome
Hold at Walsh Creek, M-28, Creighton
Road and Feeder 1

Probability: 80%
Final Fire Size: 10 acres
Time to Contain: 1 days
Time to Control: 2 days

Probability: 20%
Final Fire Size: 1500 acres

Alternative B Minimize Suppression Damage

Use water capability to flank fire between river and road.

Target Outcome
Hold between river and road with wetline
on flanks.

Worst Case Outcome
Hold at Walsh Creek, M-28, Creighton
Road and Feeder 1

Probability: 75%
Final Fire Size: 40 acres
Time to Contain: 1 days
Time to Control: 2 days

Probability: 25%
Final Fire Size: 1500 acres

Alternative C Minimize Firefighter Exposure-

Burn out from watercourses north and south of fire between road and river.

Target Outcome
Hold between watercourses, river and
road.

Worst Case Outcome
Hold at Walsh Creek, M-28, Creighton
Road and Feeder 1

Probability: 75%
Final Fire Size: 40 acres
Time to Contain: 2 days
Time to Control: 4 days

Probability: 25%
Final Fire Size: 1500 acres

WFSA No.1

Wilderness 1

Page 4

Suppression Costs

Alternative A Minimize Fire Size

Target Outcome

1 Engine 3 2 days
Suppression cost: \$1,000

Worst Case Outcome

Suppression cost: \$1,000

Alternative B Minimize Suppression Damage

Target Outcome

1 Engine 3 2 days .
Suppression cost: \$1,000

Worst Case Outcome

Suppression cost: \$544,000

Alternative C Minimize Firefighter Exposure

Target Outcome

1 Engine 3 4 days
Suppression cost: \$2,000

Worst Case Outcome

Suppression cost: \$544,000

WFSA No.1

Wilderness 1

Page 5

Impact on Resource Values

Alternative A Minimize Fire Size

Item	Target Outcome	Fallback Outcome	Worst Case Outcome	Expected Impact
Wildlife – Big Game	75	n/a	11,200	
Wildlife – Other	75	n/a	11,200	
Recreation – Wilderness	-6	n/a	-900	
Air Quality	0	n/a	-10	
Water Quality	0	n/a	-10	
Total	\$140	n/a	\$21,000	\$4,310

Alternative B Minimize Suppression Damage

Item	Target Outcome	Fallback Outcome	Worst Case Outcome	Expected Impact
Wildlife – Big Game	300	n/a	11,200	
Wildlife – Other	300	n/a	11,200	
Recreation – Wilderness	-24	n/a	-900	
Air Quality	0	n/a	-10	
Water Quality	0	n/a	-10	
Total	\$560	n/a	\$21,000	\$5,670

Alternative C Minimize Firefighter Exposure

Item	Target Outcome	Fallback Outcome	Worst Case Outcome	Expected Impact
Wildlife – Big Game	300	n/a	11,200	
Wildlife – Other	300	n/a	11,200	
Recreation – Wilderness	-24	n/a	-900	
Air Quality	0	n/a	-10	
Water Quality	0	n/a	-10	
Total	\$140	n/a	\$21,000	\$5,670

WFSA No.1

Wilderness 1

Page 6

Comparison of Alternatives

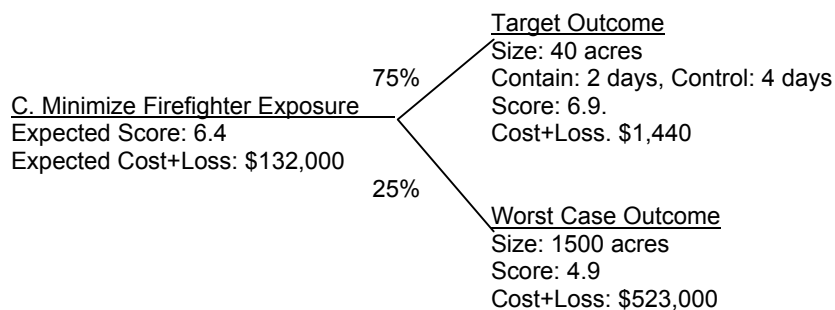
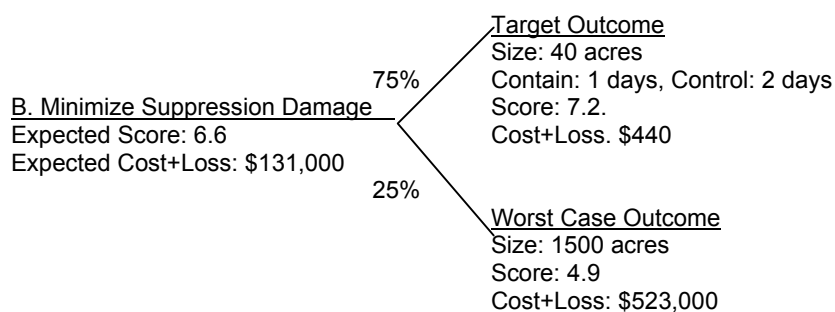
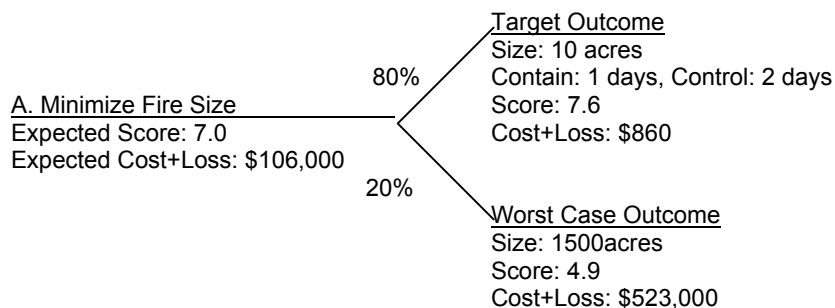
	Alternatives									
	A. Minimize Fire Size			B. Minimize Suppression Damage			C. Minimize Firefighter Exposure			
Suppression Costs	-\$110,000			-\$137,000			-\$138,000			
Resource Values	\$4,310			\$5,670			\$5,670			
Total Financial Impact	-\$105,690			-\$131,330			-\$132,330			
Total Score	7.0			6.6			6.4			
	Outcomes			Outcomes			Outcomes			
	Alt. A			Alt. B			Alt. C			
	A1	A2	A3	B1	B2	B3	C1	C2	C3	
	Probability (%)	80	0	20	75	0	25	75	0	25
Objective	Wgt.									
Safety	0.36	6.6			6.5			7.4		
Firefighter Safety	0.59	6	4	5.6	6	4	5.5	8	4	7.0
Public Safety	0.41	8	8	8.0	8	8	8.0	8	8	8.0
Economic	0.18	7.1			6.6			5.6		
Water	0.23	9	5	8.2	9	5	8.0	7	5	6.5
Wilderness	0.45	9	4	8.0	8	4	7.0	6	4	5.5
Wildlife	0.32	5	5	5.0	5	5	5.0	5	5	5.0
Environmental	0.29	6.9			6.3			5.4		
Air	0.59	9	2	7.6	8	2	6.5	6	2	5.0
T&E Species	0.41	6	6	6.0	6	6	6.0	6	6	6.0
Social	0.18	8.1			7.4			6.7		
Employment	0.33	10	10	10.0	10	10	10.0	10	10	10.0
Public Concern	0.33	8	2	6.8	6	2	5.0	5	2	4.3
Cultural	0.33	8	5	7.4	8	5	7.3	6	5	5.8

WFSA No.1

Wilderness 1

Page 7

Decision Tree



WFSA No.1

Wilderness 1

Page 8

Decision Summary

Strategy:

Minimize Fire Size

Description

Aggressive suppression to contain in one burning period. Keep within 10 acre size limit

Rationale

Least cost relative to firefighter exposure. No significant resource damages expected. Little, if any, Public Concerns. Minimal effect on cooperators.

Special Considerations

Currently there no special considerations

Information Policy

Information available from refuge office, no extra information officers needed.

Agency Administrator Signature

Date/Time

WFSA No.1

Wilderness 1

Page 9

Daily Review

Date	Time	By	Preparedness Level (1-5)	Incident Priority	Weather Forecast (Yes/No)	WFSA Valid (Yes/No)

Final Review

The elements of the selected alternative were met on:

Date: _____ Time: _____

By: _____
Agency Administrator

WFSA No.1

Wilderness 1

Page 10

Incident Complexity Analysis

Incident Complexity Rating: Type 4

Rationale: Predicted conditions will not worsen and crew will be protected by water handling equipment, additional day should see containment.

NO YES FACTOR

A. Fire Behavior

Burning index predicted to be above the 90% level.
Potential exists for "blowup" conditions (fuel moisture, winds, etc.).
Crowning, profuse or long range spotting.
Weather forecast indicating no significant relief or worsening conditions.

B. Resources Committed

200 or more personnel assigned.
Three or more divisions.
Wide variety of special support personnel.
Substantial air operation which is not properly staffed.
X Majority of initial attack resources committed.

C. Resources Threatened

Urban interface.
Developments and facilities.
Restricted, threatened or endangered species habitat.
Cultural sites.
X Unique natural resources, special designated zones or wilderness.
Other special resources.

D. Safety

Unusually hazardous fire line conditions-
Serious accidents or fatalities.
Threat to safety of visitors from fire and related operations.
Restrictions and/or closures in effect or being considered.
X No night operations in place for safety reasons.

E. Ownership

Fire burning or threatening more than one jurisdiction.
Potential for claims (damages).
Different or conflicting management objectives.
Disputes over suppression responsibility.
X Potential for unified command.

F. External Influences

Controversial wildland fire management policy.
X Pre-existing controversies/relationships.
Sensitive media relationships.
Smoke management problems.
Sensitive political interests.
Other external influences.

G. Change in Strategy

Change to a more aggressive suppression strategy.
Large amounts of unburned fuel within planned perimeter.
WFSA invalid or requires updating.

WFSA No.1

Wilderness 1

Page 11

H. Existing Overhead

Worked two operational periods without achieving initial objectives.

Existing management organization ineffective.

Overhead overextended them mentally and/or physically.

Incident action plans, briefings, etc. missing or poorly prepared.

APPENDIX M: ENVIRONMENTAL GUIDELINES FOR FOAM/RETARDANT USE

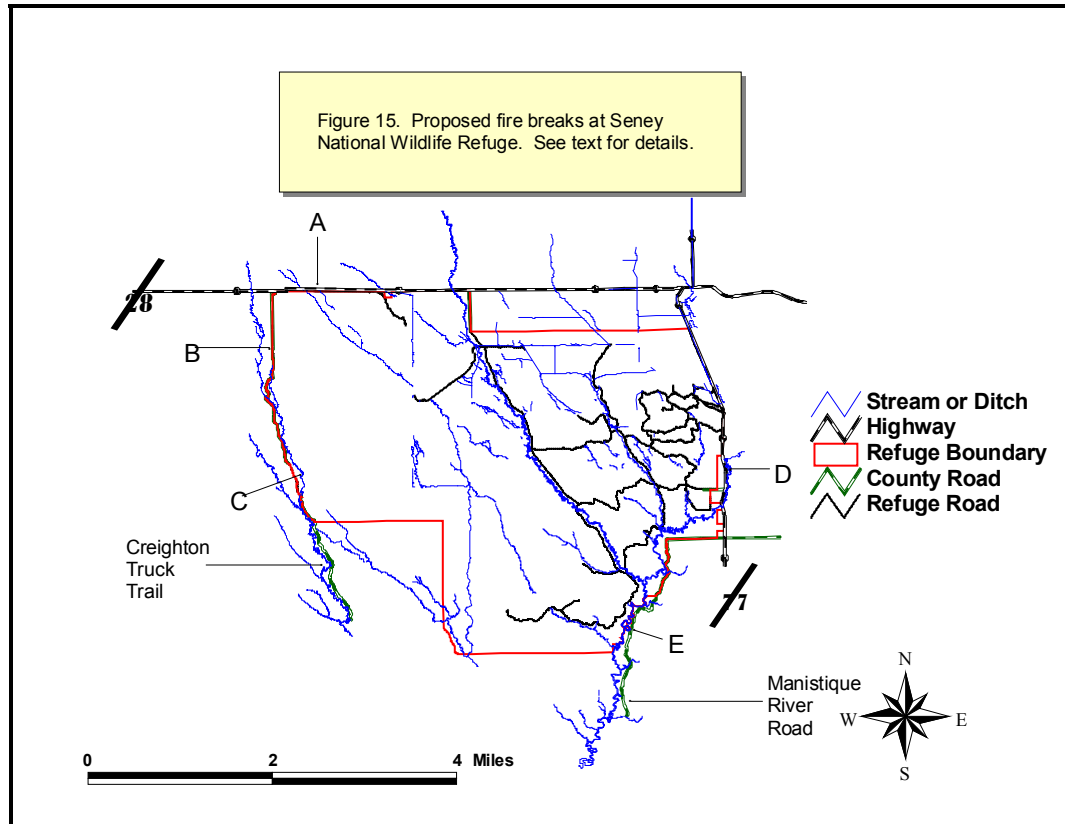
Retardants and foams will **only** be used on upland areas 300' or more from any waterbody (including all wetland types) or when life and property are in immediate danger. When used, the following guidelines should be followed to minimize the likelihood of retardant chemicals entering a stream or other body of water.

- During training or briefings, inform field personnel of the potential danger of fire chemicals, especially foam concentrates, in streams or pools.
- Locate mixing and loading points where contamination of natural water, especially with the foam concentrate, is minimal.
- Maintain all equipment and use check valves where appropriate to prevent release of foam concentrate into any body of water.
- Exercise particular caution when using any fire chemical in watersheds where fish hatcheries are located.
- Locate dip operations to avoid run-off of contaminated water back into the stream.
- Dip from a tank rather than directly from a body of water, to avoid releasing any foam into these especially sensitive areas.
- Use a pump system equipped with check valves to prevent flow of any contaminated water back into the main body of water.
- Avoid direct drops of retardant or foam into rivers, streams, lakes, or along shores. Use alternative methods of fire line building in sensitive areas.
- Notify proper authorities promptly if any fire chemical is used in an area where there is likelihood of negative impacts.
- While it is preferable that drops into or along any body of water not occur, it is possible that the fire location and surrounding terrain make it probable that some retardant may enter the water. The person requesting the retardant (such as the incident commander) must balance the impacts on the environment, i.e., potential fish kill, with the resources and values to be protected from the fire.

APPENDIX N: FIREBREAKS AND WILDLAND-URBAN INTERFACE PROJECTS

Proposed firebreak projects have been developed for boundaries at risk from wildfire (Fig. 14).

Figure 15 – Proposed fire breaks at Seney National Wildlife Refuge



Details regarding the establishment of fire breaks are:

a.) **North Wilderness Boundary** - A seven-mile break covering the north boundary of the Wilderness Area would involve clearing trees and maintaining a strip free of trees between Highway M-28 and the Canadian National Railroad tracks from the Creighton Truck Trail to the Driggs River Road. The 135 foot wide, seven mile-long strip of land (from the north railroad rail to the edge of the Highway pavement) belongs to SBC Ameritech (100 foot wide in fee title centered on the tracks) and the Refuge. Michigan Department of Transportation possesses a 66 foot easement (from the centerline of the road) to maintain the road right-of-way.

Vegetation conditions within the north boundary strip are approximately one-half open grass, one-quarter seedling and sapling trees, and one-quarter trees larger than one inch in diameter; very few large-diameter (20 inches or greater) trees exist and those that do will likely be retained. In the portion that contains trees, tamarack is by far the most common species followed in abundance by jack pine, aspen, spruce, and red pine.

When combined with the railroad tracks/graveled track bed, the highway pavement, and the right-of-way mowed north of the pavement, the fire break for the seven-mile section would be 192 foot wide. The actual area in which trees will be cut is approximately 100 foot wide. The Refuge is currently in discussion with SBC Ameritech concerning a cooperative agreement that would provide for the fire break along the seven-mile north boundary.

b.) **Northwest Wilderness Boundary** - A four-mile cooperative firebreak along the Creighton Truck Trail from M-28 to the first Creighton River bridge has been proposed with the adjacent landowner (i.e., Michigan Department of Natural Resources). The break would involve a 30 foot wide cleared area east of the sand road on Refuge land with about half of the strip already free of trees. The posted boundary line is generally 30 feet from the road edge. On the state (or west side of the road) a 15 foot wide strip would be cleared of all trees. At present, both sides are periodically mowed about 5 feet from the road edge. Both the east and west sides would be maintained with annual mowing. For the four-mile section of road, a 70 foot wide fire break would be created (25 foot road, 30 foot Refuge side, 15 foot state side).

c.) **Southwest Wilderness Boundary** - the southwest Wilderness boundary was determined not to benefit from firebreaks. The cover type along the Creighton Truck Trail greater than four miles south of Highway M-28 is classified as northern hardwoods and is thus considered a break by itself.

d.) **East Boundary with Germfask** - Refuge lands directly west of the community of Germfask consists of a mix of wetland and upland conifer species. Those adjacent and primarily mature stands of jack pine and black spruce pose a serious wildfire threat to Germfask. In 2001, a 50 foot wide fuel break was created along the one-mile interface with town. All trees were removed with the strip to be kept relatively tree-free with periodic mowing. However, due to the potential explosive nature of the older jack pine/spruce fuels present, this break was determined to be insufficient to stop a wildfire moving from the Refuge into Germfask. Therefore, directly adjacent to the existing break, a variety of fuel treatments will be evaluated in developing an effective wildfire fuel break. Thick jack pine and black spruce and mixtures of both will be thinned to different densities to reduce the potential for crown fires. Since these vegetation types are not often managed with thinning for fuel reduction, the effectiveness of different thinning treatments will be evaluated. Trees thinned or removed from the stand will be whole tree chipped with all wood and needles removed from the site or blown around the site to retain nutrients.

Within the above-mentioned forested strip, red and white pine are present in scattered locations. Wherever they are found, they will be retained with removal of jack pine and spruce conducted to encourage red and white pine regeneration. Supplemental planting of red and white pine may also be conducted. The conversion of jack pine and spruce stands to red and white pine should significantly reduce fuel hazards on those acres and integrate fuel load reduction work into a pine restoration context. Approximately 60 acres will receive fuel hazard reduction treatments in the one-mile interface with Germfask. Various thinning cuts will be conducted on 50 acres of jack pine and spruce and release thinning adjacent to red and white pine will take on 10 acres.

e.) **Southeast Boundary** - The southeast boundary area of the Refuge, along the Manistique River, is a diverse area of wetland and upland vegetation types. Marsh Creek Road runs parallel to and about ½ mile west of the Manistique River. Along the three-mile section of Marsh Creek road from its intersection with the Driggs River, towards Marsh Creek Pool, there is a wide variety of vegetation conditions present. A 1976 wildfire created expansive stands of dense, “doghair” jack pine generally adjacent to and northwest of the road. Mature jack pine/spruce/balsam fir stands that have not burned in 60+ years are common in the wetland habitats between the river and road. Several northern white cedar and eastern hemlock stands are also present in drainages leading down to and adjacent to the river. Red and white pine stands are the most common cover type on the dryer upland soils along the road. Proposed management actions will promote red and white pine and reduce understory jack pine. Restoration of historic red and white stands and red pine savannas will reduce wildfire fuel hazards south of and adjacent to the road. Hazard reduction actions will be proposed on approximately 100 acres promoting red and white pine and reducing jack pine along the three-mile section of Marsh Creek Road

APPENDIX O: GO-NO-GO CHECKLIST

Questions	Yes	No
Are ALL fire prescription elements met?		
Has ALL required current and projected fire weather forecast been obtained and are they it favorable?		
Are ALL planned operations personnel and equipment on-site, available, and operational?		
Has the availability of ALL contingency resources been checked, and are they available?		
Have ALL personnel been briefed on the project objectives, their assignment, safety hazards, escape routes, and safety zones?		
Have all the pre-burn considerations identified in the prescribed fire plan been completed or addressed?		
Have ALL the required notifications been made?		
In your opinion, can the burn be carried out according to the prescribed fire plan and will it meet the planned objective?		
If all the questions were answered "YES" proceed with a test fire. Document the current conditions, location, and results.		
Prescribed Fire Bum Boss Date		
Refuge Manager Date		

APPENDIX P: MINIMUM TOOLS EXAMPLES